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Report Number DRXTH-AS-CR-82155

CAAP Contract Number DAAA09-75-C-3005

Cornhusker Army Ammunition Plant
FINAL REPORT

Samples
- Groundwater
- Soil (3')

ENVIRODYNE ENGINEERS, INC.
12161 Lackland Road
St. Louis, MO 63141

10 AUGUST 1982

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SUPERFUND RECORDS
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Leaching Pits

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On September 15, 1981, Envirodyne Engineers, Inc. (Envirodyne) was contracted by Mason and Hanger-Silas Mason Company to conduct a preliminary contamination survey of the Cornhusker Army Ammunition Plant (CAAP). As part of this survey, 33 groundwater monitoring wells were installed at the CAAP. These wells were used to determine the water table configuration, groundwater flow directions, and estimated groundwater flow velocities. The general near surface geology and groundwater flow system are fairly simple. The water table aquifer

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20. Abstract (continued)

is a poorly graded sand, and the water table has a uniform, gentle slope to the northeast. Several potential sources of groundwater contamination have been previously identified. There are now monitoring wells at all of these sites. Based on the soil descriptions and water table configuration, some of the wells intersect the potential groundwater contaminant plumes.

Thirty-three groundwater monitoring wells, and 15 leaching pits/cesspools were sampled and analyzed. The soils at the bottoms of some of the leaching pits and cesspools were highly contaminated with explosives to a depth of three feet (the maximum depth sampled). The cesspools and leaching pits have contaminated the shallow aquifer, and these contaminants have migrated at least to the installation boundary. The burning area has also contaminated groundwater with both explosives and freon.

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CHAPTER 1

INTRODUCTION

On September 15, 1981, Envirodyne Engineers, Inc. (Envirodyne) was contracted by Mason and Hanger-Silas Mason Company, Inc. to conduct a preliminary environmental contamination survey of the Cornhusker Army Ammunition Plant (CAAP), Grand Island, Nebraska. As part of this survey, Envirodyne installed 33 groundwater monitoring wells and collected 33 groundwater samples and 30 soil samples. These samples were analyzed for a variety of known or suspected contaminants consisting of explosives, anions and metals. Furthermore, a select number of samples were subjected to gas chromatography/mass spectrometry (GC/MS) screening to identify possible, unsuspected contaminants.

Previous submissions under this contract include:

1. Quality Control Report for Cornhusker Army Ammunition Plant dated 24 November, 1981; presented the quality control plan and documented analytical methods and certification data for water and soils.

2. Geotechnical Report, Interim Report Number 2 (DRXTH-AS-CR-82140), dated 30 March, 1982; presented information regarding the soils, geology, hydrology and groundwater environment at CAAP.

3. Contamination Analysis Report, Interim Report Number 3 (DRXTH-AS-CR-82147), dated 18 May, 1982; presented the results of the chemical analyses of water, soil and quality control samples.

Pertinent portions of these previous submissions are included in this report. The objective of this report is to provide a written narrative documenting the procedures and results of Envirodyne's investigations at CAAP, and to present Envirodyne's analysis of the groundwater contamination, both present and future, resulting from industrial disposal practices at CAAP.

CHAPTER 2

FIELD SAMPLING AND ANALYSIS

SAMPLING LOCATION AND TYPES

The locations of the sampling sites are shown on Figure 2-1. The monitoring wells sampled were shallow wells (average depth of 9.8 meters) of solvent welded PVC construction. The wells were installed by Envirodyne's subcontractor, Southwestern Laboratories, Inc., as part of this contract. All of the wells sampled were installed using hollow stem augers with no fluids added during the drilling. Small quantities of water (4 gallons) were added to some of the wells during installation of the well screen/pipe and backfill to help lubricate the space between the well pipe and the inside of the auger. The CAAP Geotechnical Report contains additional information regarding well construction.

A shallow and a deep soil sample were collected at each of the cesspool/leaching pit sites shown on Figure 2-1. These were selected by USATHAMA personnel as being representative of 46 cesspools and 10 leaching pits at CAAP. The shallow samples (0-46 cm) were collected with a soil spade, and the deep samples (46-91 cm) were collected with a shelby tube. The groundwater samples were collected directly from the discharge hose to a deep well submersible pump. All of the groundwater samples, except the fraction for volatiles analysis, were filtered in the laboratory immediately upon receipt.

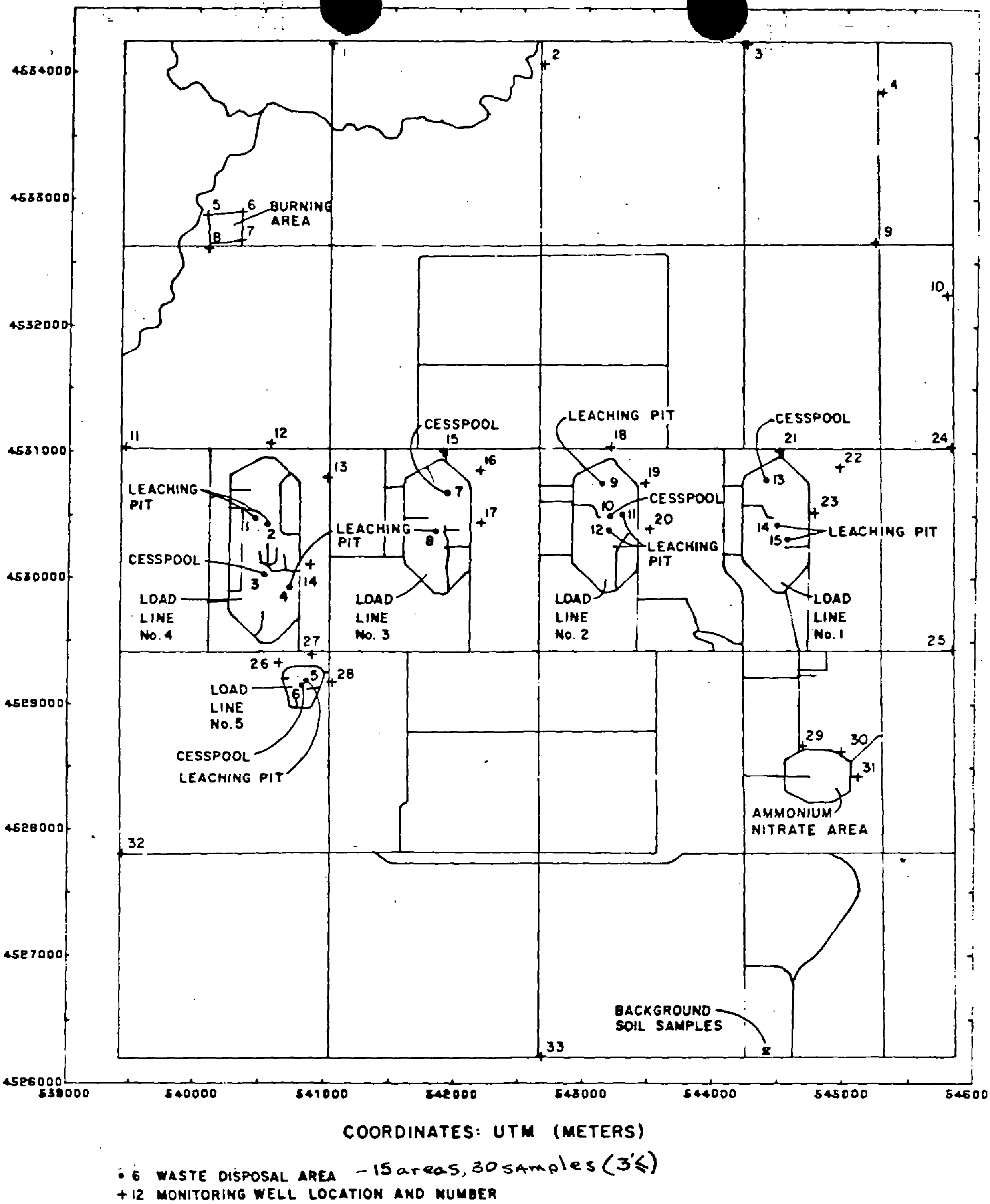
SAMPLE HANDLING

As samples were received from the field they were assigned to lots according to the analyses required. Within each lot, every sample was assigned an analysis number. A method blank and blind control spike were inserted into each lot and assigned analysis numbers.

PARAMETERS ANALYZED

The samples were analyzed for a variety of suspected contaminants. These contaminants can be grouped into four categories which are shown in Table 2-1. Table 2-1 also indicates the number of samples analyzed for each of the four categories. Table 2-2 lists the sample point numbers and indicates the category of analyses performed on these samples.

Complete tables of analytical results were previously submitted as appendices to the Contamination Analysis Report and will not be duplicated here. These appendices are:



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MANUFACTURING AND WASTE DISPOSAL AREAS

FIGURE 2-1

TABLE 2-1

SUMMARY OF ANALYTICAL CATEGORIES

Analytical Category	Parameter	Groundwater	Soil
1	Explosives: 2,4,6-Trinitrotoluene (TNT) 2,4-Dinitrotoluene (2,4-DNT) U105 2,6-Dinitrotoluene (2,6-DNT) U106 1,3,5-Trinitrobenzene (TNB) 1,3-Dinitrobenzene (DNB) Nitrobenzene (NB) U169 Cyclotrimethylenetrinitramine (RDX)	33	30
2	Anions: Nitrate Nitrite	33	0
3	Metals: Aluminum Lead	33	0
4	GC/MS Screening: Acid Base/Neutral Volatiles	13	10

TABLE 2-2

SUMMARY OF SAMPLES ANALYZED

Sample Point	1 Explosives	2 Anions	3 Metals	4 GC/MS Screen
Wells:				
G#1	x	x	x	
G#2	x	x	x	x
G#3	x	x	x	
G#4	x	x	x	x
G#5	x	x	x	
G#6	x	x	x	x
G#7	x	x	x	
G#8	x	x	x	
G#9	x	x	x	
G#10	x	x	x	x
G#11	x	x	x	x
G#12	x	x	x	
G#13	x	x	x	x
G#14	x	x	x	
G#15	x	x	x	
G#16	x	x	x	x
G#17	x	x	x	
G#18	x	x	x	
G#19	x	x	x	x
G#20	x	x	x	
G#21	x	x	x	
G#22	x	x	x	x
G#23	x	x	x	
G#24	x	x	x	
G#25	x	x	x	x
G#26	x	x	x	
G#27	x	x	x	x
G#28	x	x	x	
G#29	x	x	x	
G#30	x	x	x	x
G#31	x	x	x	
G#32	x	x	x	
G#33	x	x	x	x
Soils:				
#1 Top	x			x
#1 Bottom	x			
#2 Top	x			
#2 Bottom	x			
#3 Top	x			x
#3 Bottom	x			
#4 Top	x			
#4 Bottom	x			
#5 Top	x			x
#5 Bottom	x			
#6 Top	x			x
#6 Bottom	x			
#7 Top	x			x
#7 Bottom	x			
#8 Top	x			x
#8 Bottom	x			
#9 Top	x			x
#9 Bottom	x			
#10 Top	x			x
#10 Bottom	x			
#11 Top	x			
#11 Bottom	x			
#12 Top	x			
#12 Bottom	x			
#13 Top	x			x
#13 Bottom	x			
#14 Top	x			x
#14 Bottom	x			
#15 Top	x			
#15 Bottom	x			

Appendix A - Analytical Results by Site Identification

Appendix B - Analytical Results by Test Name

Appendix C - Quality Control Method Blanks by Analysis Number

Appendix D - Quality Control Method Blanks by Test Name

Appendix E - Analytical Results for QC Spikes and GC/MS Surrogates

Appendix F - Control Data

Appendix G - Key for Chemical Test Name Codes

ANALYTICAL METHODS

Samples were analyzed using the methods tested during the certification process. These methods were presented in the Quality Control Plan previously submitted.

FIELD SAMPLING PROCEDURES

Field sampling for the CAAP contamination survey was performed January 6 through 12, 1982 by Rick Snarski and Dale Cira of Envirodyne. Kirk Collamore of Mason and Hanger-Silas Mason Company, Inc. was present during the field sampling. Soil samples were collected from 15 locations, and groundwater samples from 33 monitoring wells were taken. A detailed log was maintained at each site, noting the date and time of sampling along with pertinent information applying to each particular site as described in the following methodologies.

Monitoring Wells

Upon completion of drilling and development by Southwestern Laboratories, Inc., the 33 monitoring wells were allowed to set for a minimum period of two weeks. At the time of sampling, measurements at each well included depth to water and total well depth from top of highest edge of PVC pipe, volume of standing water in well based on an eleven inch bore hole, and amount of water required to be purged from each well to meet the necessary five times volume removal rate prior to sampling. These data are presented in Table 2-3.

Equipment used in the sampling included a three-inch submersible electric pump, rubber hose, and gasoline powered generator. A fiberglass tape measure with a steel popper was used to determine the water table. The popper was used as a sounding

Table 2-3

SUMMARY OF GROUNDWATER SAMPLING NOTES

Well Number	Depth to G.W. from Top of PVC Pipe	PVC Pipe Stick-up Above ground	G.W. Depth From Ground Surface	Well Depth From Top of PVC Pipe	Well Depth From Ground Surface	Standing Water In Well	Calculated 5x vol. of water In Drill Hole	Gallons Purged	Date Sampled
	Feet						Gallons		
G1	17.06	2.83	14.23	32.92	30.09	15.86	167	165	1/12/82
G2	18.71	2.75	15.96	39.08	36.33	20.37	214	217	1/12/82
G3	18.40	2.75	15.65	29.46	26.71	11.06	116	127	1/12/82
G4	19.92	2.92	17.00	35.33	32.41	15.41	162	165	1/12/82
G5	18.17	2.75	15.42	30.79	28.04	12.62	133	135	1/10/82
G6	15.88	2.92	12.96	29.92	27.00	14.04	148	150	1/10/82
G7	16.63	2.92	13.71	29.92	27.00	13.29	140	142	1/10/82
G8	17.56	2.75	14.81	36.17	33.42	18.61	145	195	1/10/82
G9	19.63	2.67	16.96	31.50	28.83	11.87	125	127	1/12/82
G10	17.67	2.92	14.75	30.58	27.66	12.91	136	135	1/12/82
G11	19.02	2.67	16.35	31.25	28.58	12.23	129	135	1/03/82
G12	20.31	2.71	17.60	31.25	28.54	10.94	115	120	1/07/82
G13	21.00	2.50	18.50	36.00	33.50	15.00	158	158	1/03/82
G14	22.65	2.92	19.73	35.17	32.25	12.52	132	135	1/03/82
G15	22.02	2.58	19.44	35.00	32.42	12.98	135	142	1/07/82
G16	23.08	2.50	20.58	32.00	29.50	8.92	94	97	1/07/82
G17	22.08	2.67	19.41	33.96	31.29	11.88	125	127	1/07/82
G18	21.71	2.75	18.96	36.00	33.25	14.29	150	165	1/07/82
G19	22.17	2.50	19.67	35.83	33.33	13.66	143	143	1/07/82
G20	23.71	2.83	20.88	34.75	31.92	1-.04	116	150	1/07/82
G21	20.00	2.75	17.25	36.33	33.59	16.33	172	173	1/06/82
G22	20.08	2.81	17.27	35.25	32.44	15.17	159	165	1/06/82
G23	21.19	2.67	18.52	35.96	33.29	14.77	155	157	1/07/82
G24	20.04	2.67	17.37	33.33	30.66	13.29	136	143	1/06/82
G25	21.63	2.75	18.88	35.58	32.83	13.95	147	150	1/06/82
G26	25.85	2.67	23.18	40.79	38.12	14.94	157	157	1/08/82
G27	26.50	2.83	23.67	40.92	38.09	14.42	151	157	1/08/82
G28	24.71	2.75	21.96	39.58	36.83	14.87	156	157	1/08/82
G29	22.73	2.66	20.07	36.50	33.84	13.77	145	150	1/06/82
G30	23.48	2.67	20.81	34.63	31.96	11.15	114	110	1/06/82
G31	20.90	2.75	18.15	35.83	33.08	14.93	157	165	1/06/82
G32	32.92	2.75	30.17	45.42	42.67	12.50	132	135	1/08/82
G33	23.00	2.67	20.33	36.17	33.50	13.17	138	142	1/08/82

All data taken from field notes.

device and made with a steel bolt with a 3/4 inch pipe fitting fixed to the end to create a "popping" sound upon reaching the water.

The discharge rate of the pump was determined during the purging of the first well at 7.5 gallons per minute. This rate was used to calculate purging time required to remove five times the standing volume of water in the bore hole. All the wells had high yields and at no time during purging did the wells go dry. After the required purging time had elapsed, the sample was taken directly from the rubber discharge hose and placed in a 2.5 gallon glass jar. If volatile organic analyses (VOA) were required, water was poured from the 2.5 gallon container to the VOA vials. Samples for metal analyses were filtered through a 0.45 micron filter, acidified, and placed in a one-quart plastic cubitainer. Field filtering for metals was performed only on samples collected on January 6 (see Envirodyne notebook #319). The USATHAMA representative, Mr. Peter Wirth, deleted the requirement to field filter for metals on January 7. Samples collected after January 6 were not filtered in the field nor acidified. Instead, these samples were filtered immediately upon receipt at Envirodyne's laboratory. However, samples for metal anlaysis were taken directly from the hose discharge and collected in one-quart plastic cubitainers. These samples, along with the 2.5 gallon container, were placed in a cooler, iced for cold preservation and shipped via air freight that evening to Envirodyne's laboratory. The pump was rinsed with water from CAAP water supply Well 3 between each sampling site.

Soil Sampling

Soil samples were collected from 15 locations (cesspools and leaching pits). At each sampling site, three cores were taken and combined to form a composite sample. The number and depth of each sample was noted, as was the texture, color, percent ground cover, and characteristics of each site. The approximate size and depth of the cesspools and leaching pits were also noted (see Table 2-4). At each soil site, samples were taken to a depth of 91cm (S10 was taken to a depth of 58cm). The 0-46cm and 46-91cm intervals were placed in separate containers. The 0-46cm sample was taken by digging a 40cm hole, cleaning the side, and shearing a soil slice from the side of the hole with a long nose soil spade. At many sampling sites the ground surface was frozen to a depth of 10cm. The frozen ground was chopped away with a pick-ax (chunks of the frozen ground were included in the sample). The 0-46 cm interval sample was placed in a stainless steel bucket and composited with the 0-46cm intervals from

TABLE 2-4

CORNHUSKER ARMY AMMUNITION PLANT SOIL SAMPLING

Soil Sample Site	Description	Dimensions (feet)	Sample Depth (cm)	Texture (cm)	Date Sampled	Comments
S1	Leaching Pit (Line 4)	60 x 50 ≅10 deep	A 0-46 B 46-91	0-46 silty clay loam 46-91 clay loam	1/11/82	Composite of three samples Ground frozen from 0-10 cm
S2	Leaching Pit (Line 4)	125 x 50 ≅10 deep	A 0-46 B 46-91	0-91 silty clay loam	1/11/82	Composite of three samples
S3	Cesspool (Line 4)	12 dia. ≅15 deep	A 0-46 B 46-91	0-61 fine-medium sand 61-91 sandy loam	1/11/82	Composite of three samples
S4	Leaching Pit (Line 4)	50 x 40 ≅10 deep	A 0-46 B 46-91	0-91 sandy loam	1/11/82	Composite of three samples Ground frozen from 0-20 cm
S5	Leaching Pit (Line 5)	80 x 55 ≅10 deep	A 0-46 B 46-91	0-81 silty clay loam 81-91 sand	1/11/82	Composite of three samples Soil saturated at 20 cm
S6	Cesspool (Line 5)	6 dia. ≅14 deep	A 0-46 B 46-91	0-3 compacted sandy loam 3-91 sandy loam	1/11/82	Composite of three samples Soil saturated
S7	Cesspool (Line 3)	8 dia. ≅18 deep	A 0-46 B 46-91	0-46 sandy loam 46-91 fine-medium sand	1/11/82	Composite of three samples
S8	Leaching Pit (Line 3)	110 x 50 ≅10 deep	A 0-46 B 46-91	0-91 silt loam	1/09/82	Composite of three samples Ground frozen from 0-5 cm
S9	Leaching Pit (Line 2)	65 x 45 ≅10 deep	A 0-46 B 46-91	0-86 silty clay loam 86-91 fine-medium sand	1/09/82 1/09/82	Composite of three samples Ground frozen from 5-10 cm
S10	Cesspool (Line 2)	8 dia. ≅14 deep	A 0-16 B 46-91	0-46 silty clay loam 46-91 compacted sandy gravel	1/09/82	0-46 inches composite of three sampl[illegible] 46-91 inches compoiste of one sample 2-5 second flame noticed
S11	Leaching Pit (Line 2)	110 x 75 ≅12 deep	A 0-46 B 46-91	0-71 silty clay loam	1/09/82	Composite of three samples Ground frozen from 3-8 cm
S12	Leaching Pit (Line 2)	50 x 40 ≅12 deep	A 0-46 B 46-91	0-91 silty clay loam	1/09/82	Composite of three samples Ground frozen from 3-8 cm
S13	Cesspool (Line 1)	10 dia. ≅12 deep	A 0-46 B 46-91	0-91 medium sand	1/09/82	Composite of three samples
S14	Leaching Pit (Line 1)	70 x 20 ≅8 deep	A 0-46 B 46-91	0-76 silty clay loam 76-91 medium-coarse sand	1/09/82	Composite of three samples Ground frozen from 0-10 cm
S15	Leaching Pit (Line 1)	40 x 30 10 deep	A 0-46 B 46-91	0-91 silty clay loam	1/09/82	Composite of three samples Ground frozen from 0-5 cm

hole was cleaned out until an undisturbed soil surface was encountered. A 2 inch by 30 inch shelby tube was placed in the hole and driven down to 91cm below the ground surface. The shelby tube was pulled out of the hole and labeled. Some of the soil samples were extracted in the field and some were stored on ice and brought back to Envirodyne's facilities to be extracted in the laboratory. As mentioned earlier, soil samples were collected to a depth of 91cm with the exception of S10. At the 30-51cm depth, a very compacted sand gravel layer was encountered. Shelby tubes could not penetrate this layer. A pick-ax was used in an attempt to break through the layer. At approximately 58cm after a strike with the pick-ax, a small flame appeared in the hole for approximately 2 to 5 seconds. The sampling effort ceased at this point due to the potentially hazardous situation. The sample was taken from a depth of 46-58cm. Later, Mason and Hanger personnel collected a soil sample from the 46-91cm interval at S10. This sample was analyzed rather than the sample from the 46-58cm interval. Soil spades and the stainless steel bucket were washed with approved water between each sampling site.

QUALITY CONTROL

In each sample lot (see the Quality Control Plan for a discussion of sample lots), a method blank inserted by the analyst, a blind control spike inserted by the Field Quality Assurance Coordinator (FQAC) and, (periodically) a background and a duplicate sample were included. The control spike was prepared by adding the analyte of interest to background well water or background soil. The concentration was the middle level of the certification range. The same spike concentration was analyzed in each lot so that these results could be compared to a control chart to determine whether the analyses were in control. Surrogates were used for GC/MS analyses.

The control charts were constructed from all certification results for the spike level being used, controlling around the mean found concentration plus or minus three standard deviations as the action limits. For water samples, both natural and standard water certification results were usually pooled to generate the control chart. However, for some parameters, there was a matrix effect in the natural samples in which case only these results were used. Only natural sample data was used for soil/sediment control charts since the standard (LAAP) soil data could not be pooled with the CAAP natural data. Thus, the soil means were based on only two values.

For each lot, the spike result was compared to the control data generated by certification and any previous lots. As long as the result was in control, this new value was added to generate an updated mean and standard deviation. When the result was not in control the FQAC was notified. The spike was rerun and results were reviewed to determine whether the sample was spiked incorrectly or the analysis was in error. When it was determined that there was a problem involving the analysis, the entire lot was rerun. If the problem was isolated to the spike, the lot was usually not rerun; a lab check standard was used to show that the analysis was in control. For a summary of these situations, see Table 2-5.

In some cases it was necessary to certify new analysts by having them run one set of spikes covering the range used during initial certification. Their results were compared to the mean found values of the original analyst and were required to be within three standard deviations of that mean. The new certification data was then pooled with the original data and the control chart was developed.

The precision observed during sample analysis in most cases was comparable to the precision observed during certification. For parameters such as nitrate which showed greater variation, one factor may have been differences in techniques for preparing spiked samples. During certification, the analysts prepared their own spikes, whereas the control spikes were prepared by the FQAC and laboratory manager. Another difference was in the grouping of analytes in spike solutions. For example, nitrate and nitrite were spiked and analyzed individually during certification but were combined for sample analysis. Sample analyses were also performed over a longer period of time with other projects being analyzed in between CAAP lots. Sample lots probably reflect a more realistic data population than the certification data.

The accuracy during sample analysis generally compared favorably with certification data. This is seen when the accuracy (slope) values of various lots are compared. There is very little change from one lot to another.

ANALYTICAL RESULTS

Data Reporting

Sample results are reported in Appendices A and B of the Contamination Analysis Report. These are corrected concentration values calculated by dividing the found concentration by the accuracy (slope of the Hubaux and Vos linear regression line). All results were corrected; if the corrected result was below

TABLE 2-5

DOCUMENTATION OF OUT-OF-CONTROL DATA

Parameter	Lot	Result	Action
Water			
1,3-DNB	B	low	Lot was re-extracted and reanalyzed
1,3,5-TNB	A,B,D	low	Lots rerun; rerun values low - pooled certification data since well data appeared to be an abnormal population
NO_3	B	high	NO_2 result low so Total N - NO_2 = NO_3 was high; controlled on check standard
NO_2	A	high	Standard deviation was abnormally small, result accepted by USATHAMA
	B	low	Problem with NO_2 converting to NO_3, controlled on lab check standard
Soil			
Nitro-aromatics	A	high	Used wrong solvent, lot rerun with methylene chloride
1,3,5-TNB	A,B,C	high, low	Lots showed poor reproducibility, results accepted by USATHAMA; certification P&A used

the Hubaux and Vos detection level, it was reported as less than the detection limit. Otherwise, the corrected value was reported.

Spiked sample results first had background concentration subtracted and the recovered amount was corrected by the slope and reported.

Detection Limits/Concentrations of Concern

Detection limits for quantitative anlayses were calculated for all parameters analyzed. These limits are shown in Table 2-6. The limits were calculated using the Hubaux and Vos method applied to the certification data. A natural sample was spiked with analyte at 0, 0.5x, 1x, 2x, 5x, and 10x, where x was the desired detection level. These spikes were anlayzed in duplidate on one day. The data was plotted using the Hubaux and Vos computer program which plots a best fit linear regression line as well as confidence bands. From this, the program calculates the detection limits. If this value was less than the lowest spike analyzed, the value of the lowest spike (0.5x) was used for the detection level.

Appendices A and B of the Contamination Analysis Report contain a large amount of data, most of which consists of negative results (i.e., the analyte was not detected). For some analytes, a certain detectable concentration is considered normal, and would not be indicative of contamination. A list of concentrations above which Envirodyne believes are important to note for the parameters analyzed under this contract are shown in Table 2-7. The values shown for the non-explosive compounds were derived from the highest concentration found in the background wells (G32 and G33) and the two background soil samples collected for certification analyses (see Figure 2-1). For the explosive compounds, we believe that their presence at any concentration is worthy of note. All samples with positive results (above the levels shown in Table 2-7) are listed in Tables 2-8 and 2-9. Only the positive results for these samples are shown.

GENERAL FINDINGS

Explosives, Anions and Metals

The results of the analyses for explosives, anions and metals as summarized in Tables 2-8 and 2-9 and the GC/MS screening results (Appendix A) portray groundwater underneath most of the CAAP facility as generally clean of contamination. Groundwater at some of the areas is contaminated. Of the parameters analyzed

TABLE 2-6

HUBAUX AND VOS DETECTION LIMITS

	Water	Soil
Nitrobenzene	2.1	1.8
2,4-DNT	0.90	1.8
2,6-DNT	0.68	1.5
1,3-DNB	2.2	2.0
1,3,5-DNB	1.9	5.2
2,4,6-TNT	1.2	2.0
RDX	9.6	12
Nitrate	0.89 mg/l	NR
Nitrite	0.61 mg/l	NR
Aluminum	76	NR
Lead	19	NR

Values for water are ug/l except as noted.

Values for soil are ug/g dry weight.

NR = Not Required

TABLE 2-7

CRITERIA FOR LISTINGS IN TABLES 2-8 AND 2-9

	Concentration in	
Parameter	Water ($\mu g/l$)	Soil/Sediment ($\mu g/g$)
2,4,6-TNT	DL[(a)]	DL
2,4-DNT	DL	DL
2,6-DNT	DL	DL
1,3,5-TNB	DL	DL
1,3-DNB	DL	DL
NB	DL	DL
RDX	DL	DL
Nitrite	DL	NA[(a)]
Nitrate	5,600	NA
Lead	DL	NA
Aluminum	DL	NA

NOTE: [(a)]DL = Detection Limit
NA = Not Analyzed

TABLE 2-8

SUMMARY OF POSITIVE RESULTS FOR GROUNDWATER

Well Number	2,4-DNT	2,6-DNT	1,3,5-TNB	2,4,6-TNT	RDX	NO_3	Al
G7			2.45				
G9						15,400	
G12							122
G16	3.29			1.58			115
G17			13.7	9.20			83
G18							83
G21					117		99
G22			13.9	99.7		21,000	
G23	12.4	2.0	352	5290	307	9,070	96
G24				323	150	9,740	
G29						9,050	
G33						31,400	96

Values are μg/l (ppb)

TABLE 2-9

SUMMARY OF POSITIVE RESULTS FOR SOILS

Soils	2,4-DNT	TNB	TNT	2,6-DNT
S1 Top	9.08	973	23,000	
S1 Bottom	2.94	162	2,570	
S2 Top		36.7	2.49	
S2 Bottom		318	923	
S3 Bottom		13.4	167	
S4 Bottom		20.6	38.9	
S6 Top		51.6		
S6 Bottom		34.2	2.31	
S7 Top			13.3	
S8 Top			26.3	
S9 Top			4,930	
S9 Bottom			2,300	
S10 Top			92.3	
S10 Bottom			12.3	
S11 Top			9.79	
S12 Top	8.38		13,500	
S12 Bottom	26.3	1,110	38,000	3.82
S14 Top			1,000	
S14 Bottom		19.6	76.5	
S15 Top			5,110	
S15 Bottom			1,840	

NOTE: Values are in µg/g dry weight.

quantitatively, 2,4-DNT; 2,6-DNT; 1,3,5-TNB; 2,4,6-TNT; RDX; NO_3; and aluminum were found in varying concentrations. It is important to note when reviewing these results that the apparently high concentration of some parameters should not be seen as evident of contamination from the CAAP facility. Well G33, for example, is located upgradient from any potential contamination source at CAAP, yet this well shows nitrate concentrations of 31,400 ppb. This same well has an aluminum concentration of 96 ppb. The high nitrate concentration may be due to overfertilization of the predominantly agricultural lands upgradient and/or the cattle feedlot operation in the immediate area. The aluminum concentration of 83-122 ppb found in seven of the 33 wells can also be considered as background levels due to their relative positions to potential contamination sources.

Keeping this background data in mind, the results can be more accurately interpreted. Of the twelve monitoring wells with positive results, seven can be considered contaminated to varying degrees. Wells G9, G12, G18, G29, and G33 are listed in Table 2-8 because of their high concentrations of nitrates and/or aluminum. These wells have (at most) the background concentration levels of these parameters as discussed earlier. The most significant levels of contamination occur in Wells G21, G22, G23, and G24 which are located just northeast and downgradient from Load Line 1 in the east-central section of the CAAP facility. Well G21 has concentrations of 117 ppb RDX and 99 ppb aluminum. Well G22 shows a 13.9 ppb 1,3,5-TNB, 99.7 ppb 2,4,6-TNT and 21,000 ppb nitrates. The most clearly contaminated well is G23 with 12.4 ppb 2,4-DNT, 2.0 ppb 2,6-DNT; 352 ppb 1,3,5-TNB; 5290 ppb 2,4,6-TNT; 307 ppb RDX; 9070 ppb nitrates; and 96 ppb aluminum. Well G24 has concentrations of 323 ppb 2,4,6-TNT and 150 ppb RDX, as well as 9,740 ppb nitrates. The other wells considered contaminated, but to a lesser degree, include G7 with 2.45 ppb 1,3,5-TNB; G16 with 3.29 ppb 2,4-DNT; 1.58 ppb 2,4,6-TNT; and G17 with concentrations of 13.7 ppb 1,3,5-TNB; and 9.20 ppb 2,4,6-TNT.

Table 2-9 summarizes the resulting soil contamination. Fewer parameters were analyzed in soils than in the groundwater, focusing on explosives and the GC/MS screening. As a result, all of the soil samples appear to be contaminated to some degree with the exception of S5, S13, the top intervals of S3 and S4, and the bottom intervals of S7, S8, and S11. The most commonly occurring contaminant of the soil samples is 2,4,6-TNT, ranging from 2.31 to 38,000 μg/g which was found in all of the contaminated soils. 1,3,5-TNB was also found fairly often in ranges from 13.4-1,110 μg/g. 2,4-DNT was found in two sites and ranged from 2.94 to 26.3 μg/g, while 2,6-DNT was found in only one sample at a concentration of 3.82 μg/g.

From reviewing the table it becomes evident that four sites are severely contaminated. These include S1 with a 2,4-DNT concentration of 9.08, TNB at 973, and TNT at 23,000 μg/g in the upper interval. The bottom interval has a somewhat lower concentration, but is still considered high. S9 has a top interval concentration of 4,930 μg/g TNT, and a bottom interval TNT concentration of 2,300 μg/g. S12 appears to be the most severely contaminated soil sampling site. The top interval has a 8.38 μg/g 2,4-DNT; 1,110 μg/g TNB; 38,000 μg/g TNT; and a 3.82 μg/g concentration of 2,6-DNT. Soil site S15 has a top interval TNT concentration of 5,110 μg/g, and a bottom interval concentration of 1,840 μg/g TNT. These results are discussed more thoroughly in Chapter 4 by specific areas in an attempt to correlate the potential sources with the resulting concentrations in the associated wells.

GC/MS Results

The results of GC/MS analyses of waters and soils are presented in Appendix A of this report: GC/MS Chemical Analysis Results by Test Name. The most significant result of these analyses is the general lack of large numbers of previously unsuspected contaminants in significant concentrations in the samples. The GC/MS screening results are negative for the most part. Nearly all samples contain background levels (1-2 ppb) of several compounds which are also seen in the laboratory blanks. These include such compounds as benzene, toluene, trichlorobenzene, trichloroethane, pentane, hexane and several phthalates. Methylene chloride and freons are also observed in samples and blanks in the 10-30 ppb range. Some polynuclear aromatic compounds are seen in soil samples at the low ppb level, but are not considered to be a result of contamination.

Five compounds were identified, which by the concentration and association with other contaminants, are considered to be significant. These are summarized in Table 2-10 by site. Included for comparison in the table are GC/MS results for 2,4-DNT and TNT. Of interest is the apparent positive correlation between the presence of 4-nitrophenol, 2,4-dinitrophenol and hydroxyazobenzene in certain of the soils and waters and the presence of the known contaminants, 2,4-DNT and TNT. Hydroxyazobenzene also appears in two soils (S6 and S7) without apparent association with the nitrotoluenes. However, the quantitative chemical analyses showed the presence of small amounts of TNT and TNB in these samples (see Chapter 4).

Hydroxyazobenzene was identified by computer match of the mass spectrum to the libraries of some 30,000 compounds on the GC/MS system. This search incorporates an algorithm for selecting the ten "best" matches of the unknown spectrum to the library

Table 2-10

SUMMARY OF NOTABLE GC/MS RESULTS

Site	Compound[a] 4 NP	24 DNP	HAZOB	DOAD	Freon 113[b]	24 DNT	246 TNT
G6					2,500		
G16			33.1	130		4.0	
G22							16.0
G33				12.7			
S1	40.2	625	12.8			12.3	166
S6			35.0				
S7			7.5				
S9	1.6		5.6				38.5

(a) 4NP = 4-Nitrophenol
24DNP = 2,4-Dinitrophenol
HAZOB = 4-hydroxyazobenzene
DOAD = Dioctyladipate
Freon = Freon-113 Trichlorotrifluoromethane
24 DNT = 2,4-Dinitrotoluene
246 TNT = 2,4,6-trinitrotoluene
Concentration units are in ug/l for waters, ug/g for soils

(b) Only those results in excess of 40 ug/l are reported here.

spectra. Each of the matches is listed with an associated similarity index which indicates how good the match is. In the case of hydroxyazobenzene, as with most library searches, the unknown spectrum was also visually compared to those of the library matches, allowing the GC/MS operator to determine the reasonableness of the match. In this case, the operator felt that the hydroxyazobenzene match was not only the best, but a good match.

The presence of nitrophenols in association with explosives is not unreasonable as these compounds could easily be by-products of the nitration operations at CAAP depending on the grade of toluene used in the production process. Phenols are often found as impurities in commercial-grade toluene and are, therefore, available for nitration during the explosives production. The presence of the hydroxy group on the benzene ring will lead to substitution in the ortho- and para- positions, thus leading to compounds such as 4-nitrophenol and 2,4-nitrophenol. In addition, it is possible that the nitrophenols are also environmental degradation products of the explosives themselves. The reason for the presence of hydroxyazobenzene is not readily apparent since the compound is not known to have been produced or utilized at the site. It is known that azobenzene can be produced by the reduction of nitrobenzene by a relatively mild reducing agent such asn Sn^{+2}. Therefore, it is postulated that the hydroxy-azobenzene may be an environmental degradation product of nitroaromatics.

The compound, dioctyladipate, was found in significant concentrations (130 ppb) in Well G16 along with hydroxyazobenzene and DNT. However, it was also found in Well G33 without association with explosives or other contaminants. Well G33 is located upgradient from any known source of on-site contamination. Dioctyladipate is a commercial plasticizer, commonly blended with other general purpose plasticizers such as bis(2-ethylhexyl) phthalate for processing polyvinyl chloride. It is also used as a solvent in glues such as those used for PVC. Therefore, it is possible that the compound is an artifact of well construction or sampling. However, its presence in only two wells and at significant concentrations in Well G16 is not consistent with this hypothesis. It is felt that the question of the origin of dioctyladipate cannot be resolved with the existing data.

Additional information that would be helpful in resolving this issue would include the use of a more selective method for analysis of these samples, information on whether the compound was or was not used at the facility and analysis of samples from the well construction materials. These latter samples might include analysis of the glue as well as organic-free water left in contact with PVC pipes for a period of time.

Since the identification of this compound was made via library search on the GC/MS, it is felt that it may also be desirable to use a more selective, quantitative method for this compound. This may include the running of standard solutions of the compound itself as well as the samples and sample spikes on the same GC/MS system, thus eliminating any bias due to variations in instrumentation (i.e., the instrument on which the library spectrum was obtained versus that on which the samples are run) or matrix (standards versus samples).

The final compound of interest is Freon-113 (trichlorotrifluoroethane). Freon-113 and other freons are present in a number of wells at the 10-30 ppb level, but these levels are considered to be analytical artifacts owing to the presence of freons as refrigerants and as laboratory extraction solvents. However, the level of Freon-113 in Well G6 is at too high a level (2,500 ppb) to be a laboratory background artifact. In addition, an unusual freon, trifluorodichloroethane, was found in Well G6 at 31 ppb and was not detected in any other sample. The well was re-sampled and re-analyzed and the results confirmed the presence and concentration range of both compounds in Well G6.

We have reviewed the sources/articles listed in Table 2-11 regarding Freon-113 and could find no criteria data for the toxicity of freon compounds in water or air. According to Source 1 (Table 2-11), freon compounds generally do not have acute high toxicities. We do not view the presence of Freon-113 in the groundwater at CAAP as posing any immediate health hazards.

TABLE 2-11

SOURCES/REFERENCES REVIEWED BY
ENVIRODYNE REGARDING FREON COMPOUNDS

1) American Industrial Hygiene Association, Hygienic Guide Series, 1968.

2) Sittig, Marshall, Handbook of Toxic and Hazardous Substances, Noyes Data Corporation, Park Ridge, NJ, 1981, pp.677-678.

3) Sittig, Marshall, Hazardous and Toxic Effects of Industrial Chemicals, Noyes Data Corporation, Park Ridge, NJ, 1979.

4) USGPO, Federal Register, Vol 45 (231), November 28, 1980, pg.79328.

5) National Cancer Institute, Carcinogenic Technical Report Series, No. 106, 1978, "Bioassay of Trichlorofluoromethane for Possible Carcinogenicity," CAS No. 75-69-A, U.S. Department of HEW, Bethesda, MD, Publ. No. (NIH) 28-1356.

6) Department of Transportation, Coast Guard, CHRIS, Hazardous Chemical Data, October 1978.

7) Chemical Abstracts Service (CAS), Ninth Collective Index, Vols. 76-85, 1972-1976, American Chemical Society, Washington, DC, 1977.

8) CAS, Vols. 88-93, 1979-1981, American Chemical Society, Washington, MO, various dates.

9) Kirk-Othmer, Encyclopedia of Chemical Technology, 2nd edition, 1978.

10) American Industrial Hygiene Association Journal, Index, 1978-1981.

11) American Conference on Governmental Industrial Hygienists, Threshold Limit Values of 1980, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1980.

12) Sax, N. Irving, Dangerous Properties of Industrial Materials, 5th edition, 1979, Van Nostrand-Reinhold, New York.

13) Mockison, Frank W., ed., Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA, U. S. Department of Health and Human Services, U. S. Department of Labor, Washington, DC, 1981.

14) Patty, Frank, ed., Industrial Hygiene and Toxicology, 2nd edition revised, Interscience Publisher, New York, 1963.

15) Callahan, Michael, "Water-related Environmental fate of 129 Priority Pollutants." Vol. II, EPA 440/4-79-029B, 1979, pp.62-1 to 62-8 and 63-1 to 63-8.

CHAPTER 3

HYDROGEOLOGY

AQUIFER DESCRIPTION

Soils at CAAP are developed from windblown Peorian loess material deposited over Pleistocene age sands and gravel. Top soil depths range from 30 to 60 cm, averaging 35 cm throughout most of the plant site. This top soil is very consistent in its make-up, being described as a dark brown to black, organic clayey silt to silty clay, with a sharp boundary at the underlying B horizon. The lower horizon varies somewhat over the plant from a dominantly light, yellowish-brown low plasticity, silty stiff clay to lenses of light yellowish brown clayey silts. Generally, the fine grained horizons vary in thickness from 1 to 3 meters, averaging about 3 meters. These upper layers tend to thin out in an easterly direction where the alluvial sands become exposed at the surface. The entire plant is underlain by alluvially deposited sand and gravels of Pleistocene era, from 15 to 30 meters thick, generally poorly graded with little or no fines and are either grey or light yellowish brown in color (see Figure 3-1). This sand unit is first encountered at the surface along the eastern boundary to as deep as 6 meters below grade near the northwestern boundary. In some isolated areas, this sand layer can be described as poorly sorted (well graded) containing a homogeneous mixture of sand to pea-gravel sized particles.

This sand and gravel unit is the principal supply of groundwater for Hall County. At CAAP, its saturated thickness is reported to range from 15 to 30 meters (none of the wells installed under this contract fully penetrated the sand and gravel unit). This aquifer yields large quantities of good quality water. Yields from high capacity irrigation wells developed in this aquifer have been measured at more than 4,000 liters per minute. The aquifer receives most of its recharge from local infiltration of precipitation and irrigation water. At CAAP, the average recharge rate has been estimated to range from 1 to 2.5 inches of water per year[1], with the higher rate corresponding to the eastern part of the plant where the sand unit crops out at the surface. The depth from the ground surface to the water table at CAAP ranges from 4 meters to slightly over 9 meters.

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[1]Bureau of Reclamation, Grand Island, Nebraska, Fred Otradovsky, personal communications, March 23, 1982.

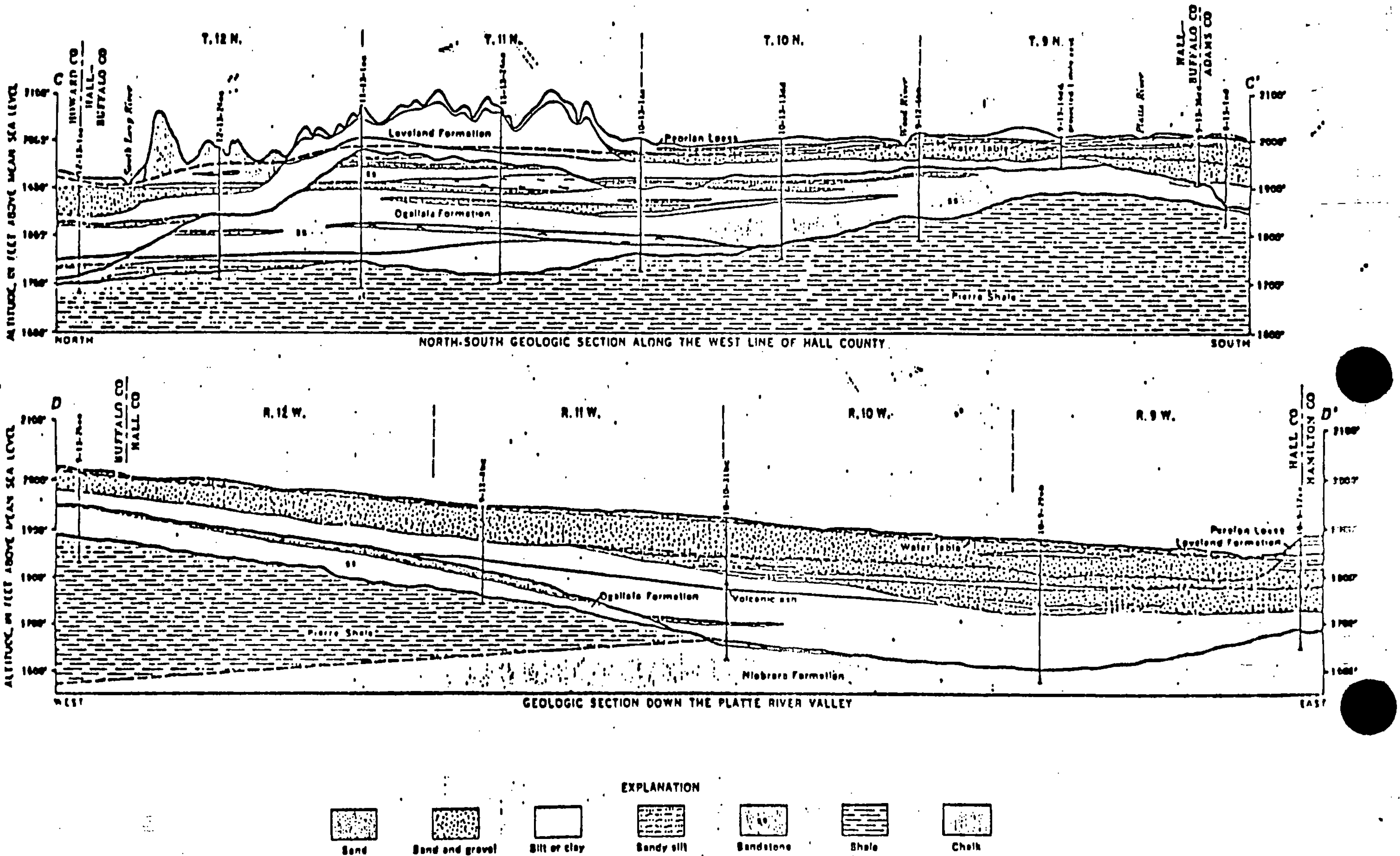

Figure 3-1 Geologic Sections Across Hall County, Nebraska (Sheet 1 of 2)

Reference: Keech, C.F. and V.H. Dreeszen, 1964, Availability of ground water in Hall County, Nebraska: U.S.G.S. Hydrologic Investigations Atlas HA - 131.

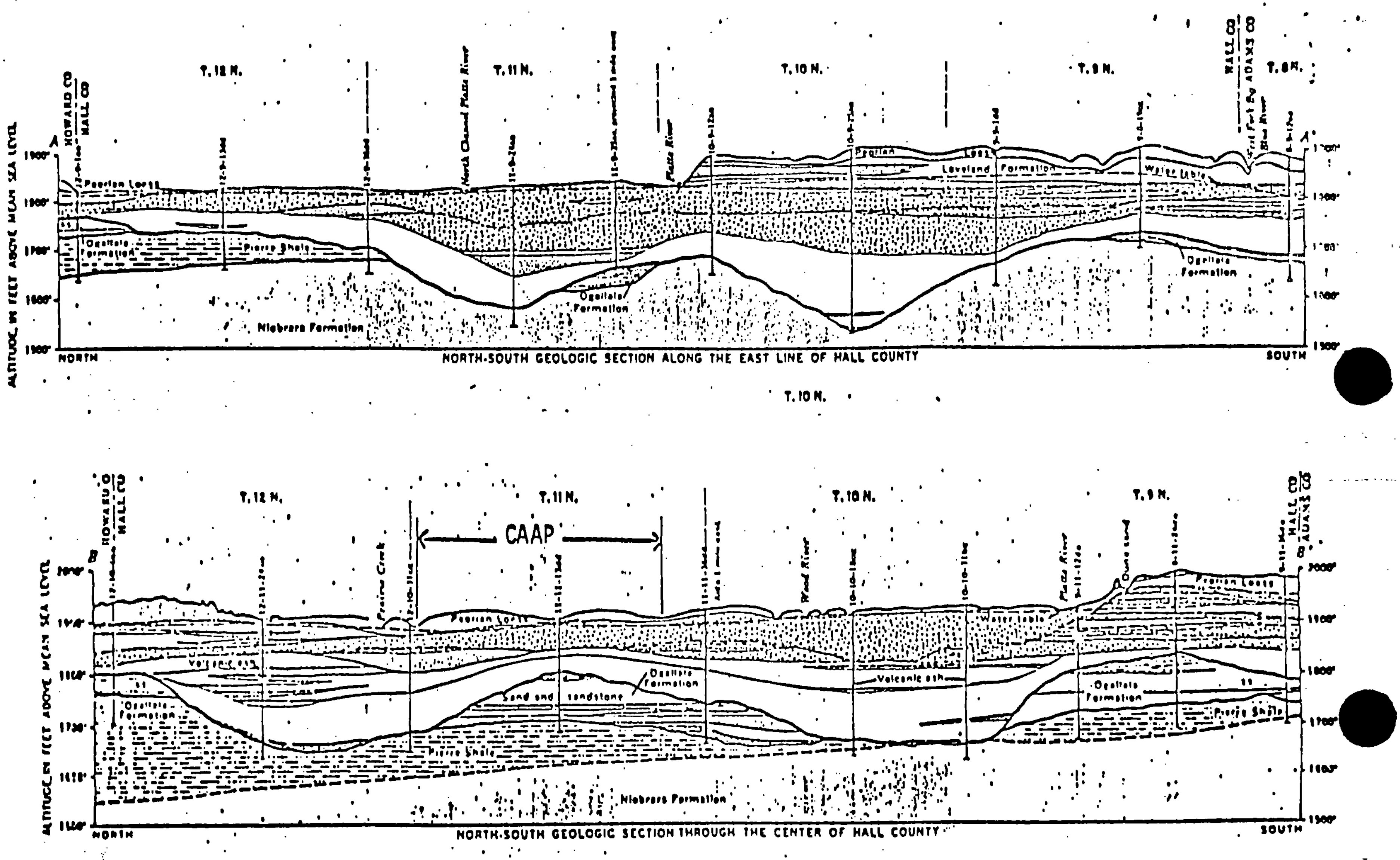

Figure 3-1. Geologic Sections Across Hall County, Nebraska (Sheet 2 of 2)

AQUIFER TESTING

Slug tests were performed by Envirodyne on ten of the monitoring wells at CAAP. These included Wells G3, G7, G16, G17, G22, G23, G24, G27, G30 and G33. The field procedure consisted of rapidly lowering a solid slug of known volume to the bottom of the well causing an essentially instantaneous rise in the water level in the well. The rate at which the water level returned to equilibrium was then measured and recorded. The slug consisted of sealed sections of PVC pipe filled with a mixture of sand and water. The maximum diameter of the fittings used in sealing the pipe sections was less than 7.6 cm. Pipe section lengths were approximately 0.75 meters, and two sections were made of 2.5-inch ID (nominal) pipe and a third section was made of 2-inch ID (nominal) pipe. The three pipe sections were wired together (end-to-end) to act as a single slug (short sections were used for ease of transport).

The water level recovery was measured with a weighted float to which was attached an appropriate length of fishing line. After the initial water level measurement (static water level) was made with a tape measure, the small weighted rubber float was lowered into the well. After the float had stabilized, a very small crimp-type fishing weight was attached to the fishing line at the level of the top of the well casing. The float and fishing line were then removed from the well. The calculated water level rise (from the displacement volume of the slug) distance was measured down the fishing line from the static water level mark, and this position was also marked on the fishing line with a small fishing weight. The distance between the two weights was divided into convenient intervals and marked with a series of additional weights. The slug was then lowered into the well, closely followed by the float. As the fishing weights passed the top of the well, the time elapsed since the slug first entered the water was recorded (it took less than three seconds for the slug to fully submerge).

This system enabled very precise and accurate measurements to be made at close intervals, even though the water level sometimes returned to equilibrium in less than 20 seconds after an initial rise of 122 cm. The data from these tests are included as Appendix B. Three tests were made at each well, and as can be seen by the data, this method yielded extremely reproducible results.

The recovery data was then analyzed using the curve matching technique described by Papadopulos (1967). Since the aquifer is not a confined aquifer, and the wells used for the tests were not fully penetrating (assumptions for this method), the results obtained (shown in Table 3-1) are not extremely

TABLE 3-1

AQUIFER TEST RESULTS

Well Number	Coefficient of Permeability (cm/sec)	Storage Coefficient (based on type curve matching*)
3	2.9×10^{-2}	10-10
7	6.3×10^{-2}	10-8
16	7.6×10^{-2}	10-8
17	5.5×10^{-2}	10-3
22	5.9×10^{-2}	10-9
23	8.7×10^{-2}	10-10
24	2.2×10^{-2}	10-10
27	8.2×10^{-2}	10-7
30	9.7×10^{-2}	10-9
33	1.3×10^{-1}	10-5

* Actual storage coefficient for an unconfined aquifer would be $>10^{-1}$.

accurate and should tend to describe a more permeable soil than is actually present. However, since the soils are so highly permeable, well interference effects may be significant, which would tend to skew the error in the opposite direction, especially for the initial readings. However, since the latter portion of the data curves match the type curves fairly well, Envirodyne believes that the results shown in Table 3-1 are fairly accurate.

GROUNDWATER FLOW DIRECTIONS

As shown by Figure 3-2, the water table gradient throughout CAAP is relatively uniform, ranging from a high of 0.0017 (0.17 percent) to a low of 0.0007 (0.07 percent). These gradients are low probably because of the permeable nature of the soils and the low topographic relief in the general vicinity of CAAP. The horizontal coefficient of permeability of some of the more permeable gravel zones is reported to be as high as 670 feet per day[2] (2×10^{-1} cm/sec). The low topographic relief combined with the permeable soils also suggests that a relatively high percentage of the precipitation soaks into the ground and recharges the shallow aquifer. As described earlier, this is especially true in the eastern portion of the plant where the permeable sands crop out at the surface.

Except for the water supply wells, there are apparently no major groundwater discharge areas at CAAP. This means that there is diffuse groundwater recharge occurring throughout the plant. There probably is, therefore, a slight vertical component to the direction of groundwater flow in the down direction throughout the plant. This vertical component of the flow vector is probably stronger in the vicinity of the sandy soil outcrop band, and slightly lower in the western portion of the plant where the surficial fine grained soils are generally thicker.

GROUNDWATER FLOW RATES/CONTAMINANT MIGRATION RATES

Horizontal groundwater flow velocities in the sand and gravel aquifer at CAAP can be estimated by a variety of methods. The deeper, gravelly zones are more permeable than the shallower, more sandy zones. These more permeable zones seem to be well interconnected as indicated by the reported high capacity well yields. Since there appears to be no confining layer between the shallower sandy zones (typically tapped by the monitoring wells at CAAP) and the deeper

[2] Bureau of Reclamation, Grand Island, Nebraska, Personal Communication, March 15, 1982.

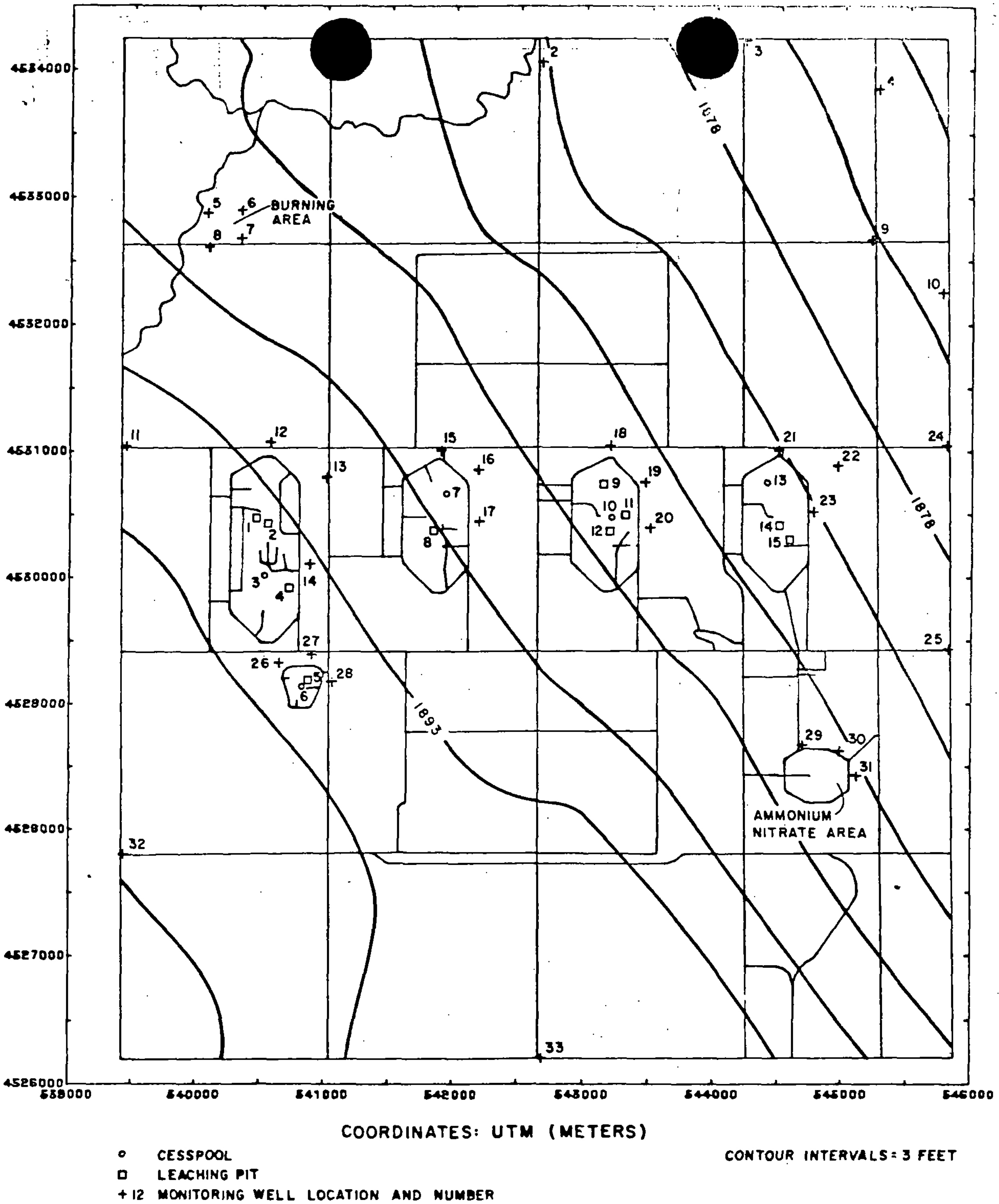

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FIGURE 3-2

WATER TABLE CONTOUR PLOT

gravelly zones, Envirodyne believes that the horizontal hydraulic gradients within the gravelly zones are essentially the same as the water table gradient shown by the water levels in the monitoring wells (Figure 3-2). If this is true, the horizontal flow velocities in the more permeable gravelly zones would be higher than in the less (though still highly) permeable sandy zones. The differences in the flow velocities would be proportional to the differences in porosity and the coefficient of permeability.

The aquifer tests were conducted on the shallow monitoring wells and, therefore, the test results probably reflect the permeabilities typical of the shallower, sandy zones. By applying Darcy's Law to these test results as shown in Table 3-2, it appears that the horizontal flow velocities in the sandy zones at CAAP range from 23 to 120 meters per year. For the gravelly zones, the Bureau of Reclamation has estimated that the coefficient of permeability might be 2 x 10^{-1}cm/sec, or slightly greater than the most permeable soil tapped by a monitoring well (1.3 x 10^{-1}cm/sec). With the same estimate of effective porosity as that used in Table 3-2 the range of groundwater velocities within the gravelly zones, as reflected by the variations in the water table gradient, would be from 123 to 252 meters per year.

An alternative method for determining the flow velocity in the upper portion of the sand and gravel aquifer would be to determine the maximum contaminant migration rate from the results of the sampling and analysis program. Utilizing this method requires that several assumptions be made which may not be valid. In order to employ this method, it must be assumed that some unique compound/analyte has a known point of origin, that it migrates at the same rate as groundwater, and that the time is known at which it was first introduced into the groundwater flow system. As groundwater contaminants at CAAP, the explosive compounds TNT and RDX have several known points of origin. Based on the water table configuration, the presence of these compounds in some of the wells can be confidently linked to certain cesspools and leaching pits, and the dates that these cesspools and leaching pits were first put into use are known. Since some of these leaching pits and cesspools have been excavated into the sand and gravel unit to within 2 to 3 meters of the present water table, it can safely be assumed that these explosive compounds were introduced into the groundwater flow system within the first year of operation. The assumption that cannot be validated is that these compounds migrate at the same rate as the groundwater. If this assumption is valid, the groundwater flow rate determined by the following analysis is probably very accurate.

TABLE 3-2

SHALLOW HORIZONTAL GROUNDWATER FLOW RATES

Well Number	Horizontal Coefficient Permeability (K) cm/sec	meters/yr	Water Table Gradient (i) (dimensionless)	Horizontal Flow Rate (v)[(a)] (meters/year)
G3	2.9×10^{-2}	9,100	0.0011	29
G7	6.3×10^{-2}	20,000	0.0008	46
G16	7.6×10^{-2}	24,000	0.0011	73
G17	5.5×10^{-2}	17,000	0.0011	52
G22	5.9×10^{-2}	19,000	0.0014	73
G23	8.7×10^{-2}	27,000	0.0012	97
G24	2.2×10^{-2}	6,900	0.0012	23
G27	8.2×10^{-2}	26,000	0.0008	64
G30	9.7×10^{-2}	31,000	0.0014	120
G33	1.3×10^{-1}	41,000	0.0007	79

NOTES: (a) $V = \frac{Ki}{n}$, where V, K and i are as defined above, and n is the estimated effective porosity, estimated at 0.35 for all ten calculations.

Well G24 contains both TNT and RDX in significant concentrations (323 and 150 μg/l respectively). It is located directly downgradient from both leaching pits S14 and S15 (Figure 3-2), and lies 1,500 and 1,600 meters, respectively, away from these pits. Both pits have been excavated into the sand and gravel unit to within 2 to 3 meters of the water table. RDX was first used in this area (Load Line 1) in 1950. Therefore, by 1982 the RDX found in Well G24 had to migrate at an average rate of at least 1,500 meters/32 years = 47 meters/year. Since the RDX concentration in Well G24 is relatively high, the contaminants have undoubtedly migrated beyond Well G24, and, therefore, the actual groundwater flow rate is probably significantly greater than 47 meters per year.

Well G18 is directly downgradient from leaching pit S8 and cesspools 26, 27, 28 and 29 (see Figures 4-3 and 3-2), at a distance of about 1,500 meters. Leaching pit S8 was first put into operation in 1966, but the cesspools were all used during World War II activities (see Tables 3-3 and 3-4), representing a maximum time lapse of 40 years for migration to occur. Well G18 did not contain detectable concentrations of either TNB, TNT or any other explosive (eg. RDX). Therefore, either the migration rate for TNB and TNT has been less than 37 meters/year or the contaminants have dispersed to the point that their concentration in the aquifer at Well G18 is below the detection limits (see Table 2-6).

Well G17, located approximately 350 meters downgradient from the cluster of cesspools and leaching pit S8 contains low concentrations (13.7 and 9.20 μg/l) of both TNB and TNT (respectively). It is also approximately 425 meters directly downgradient from cesspool 30, which has the same history of use as cesspools 26 to 29. Any single cesspool or combination of these cesspools could be the source of the contamination in Well G17, thus indicating a minimum contaminant migration rate of about 9 meters per year. Therefore, the horizontal migration rate of freely migrating contaminants (i.e., the groundwater flow rate) in the vicinity of Load Line 3 can fairly confidently be bracketed between 37 meters per year (as calculated between leaching pit S8 and Well G18) and 9 meters per year (as calculated between leaching pit S8 and Well G18). This range agrees fairly well with the range of flow rates shown in Table 3-3.

GENERAL DISCUSSIONS

The shallow aquifer at CAAP is a highly yielding, generally unconfined sand and gravel unit of fluvial origin, which produces most of the groundwater in Hall County. It is overlain by fine grained eolian deposits. Groundwater in this aquifer is flowing to the northeast at a rate of between 29 and 120 meters/year as calculated based on the results of aquifer testing. This velocity range is generally confirmed by the analytical results.

TABLE 3-3

EXPLOSIVES CESSPOOL OR LEACHING PIT USAGE[a]

Cesspool or Leaching Pit (Number)[b]	Facilities Used During			Cesspool or Leaching Pit (Number)[b]	Facilities Used During		
	World War II	Korea	Vietnam		World War II	Korea	Vietnam
1	X	X	X	29	X		X
2			X	30	X		X
3			X	31	X	X	
4	X	X	X	32		X	
5			X	33	X	X	X
6	X	X		34		X	
7	X		X	35	X	X	
8			X	36			X
9			X	37	X	X	X
10			X	38	X	X	X
11			X	39	X	X	
12	X	X	X	40	X	X	X
13		X	X	41	X	X	X
14		X	X	42	X	X	X
15		X	X	43	X	X	
16	X	Unknown		44	X	X	
17	X	X	X	45	X	X	
18	X	X	X	46	X	X	
19	X	X	X	47		X	
20	X	X	X	48		X	X
21			X	49		X	X
22	X	X	X	50	X	X	X
23	X	X		51		X	
24	X	X		52		X	X
25	X			53	X	X	X
26	X		X	54		X	X
27	X		X	55	X	X	X
28	X		X	56		X	X

NOTES: (a) From Mason & Hanger - Silas Mason Company, Inc., CAAP, Grand Island, NE, July 1982.
(b) Numbers 1-15 conform to numbering system for soil samples taken by Envirodyne.

TABLE 3-4

LOAD LINE PRODUCTION INFORMATION

Period of Activity	Item Description	Explosive(s) Fillers
World War II:		
Line 1	1,000 lb bomb, 105MM projectile	TNT, AN
Line 2	1,000 lb bomb	TNT, AN
Line 3	1,000 lb bomb	TNT, AN
Line 4	(Produced for only 2-3 months)	TNT, AN
Line 5	Boosters and Supplementary Charges	TNT, Tetryl
Unknown Locations	2,000 lb bomb; 90, 220 and 260 lb fragment bombs	TNT, AN; TNT
Korea:		
Line 1	3.5 inch rocket	TNT or Comp B
Line 2	3.5 and 4.5 inch rockets	TNT or Comp B
Line 3	None	None
Line 4	155MM projectile	TNT
Line 5	Fuses (M404A1 and M404A2, M52A1B1)	Tetryl
Vietnam:		
Line 1	M117 bomb	TNT, AN, AL
Line 2	M117 bomb	TNT, AN, AL
Line 3	M117 bomb, MK 82 bomb	TNT, AN, AL
Line 4	M64, M65, M117, MK 82 bombs; 8 inch projectile	TNT, AN, AL
Line 5	Mines and Canisters (XM45, XM41, XM41E1, XM65, CDU 4/B, CDU 14/B)	RDX and Lead Azide

NOTES: (a)From Mason and Hanger - Silas Mason Company, Inc., CAAP, Grand Island, NE, July 1982.

CHAPTER 4

SURFACE AND SUBSURFACE CONTAMINANTS

CONTAMINATED AREAS

Table 2-8, as discussed in Chapter 2, indicates that there are several areas at CAAP where shallow groundwater has been contaminated. By comparing this table with the GC/MS results, Figures 4-1 through 4-6, and the water table map (Figure 3-2), the most likely source of the contamination can often be determined.

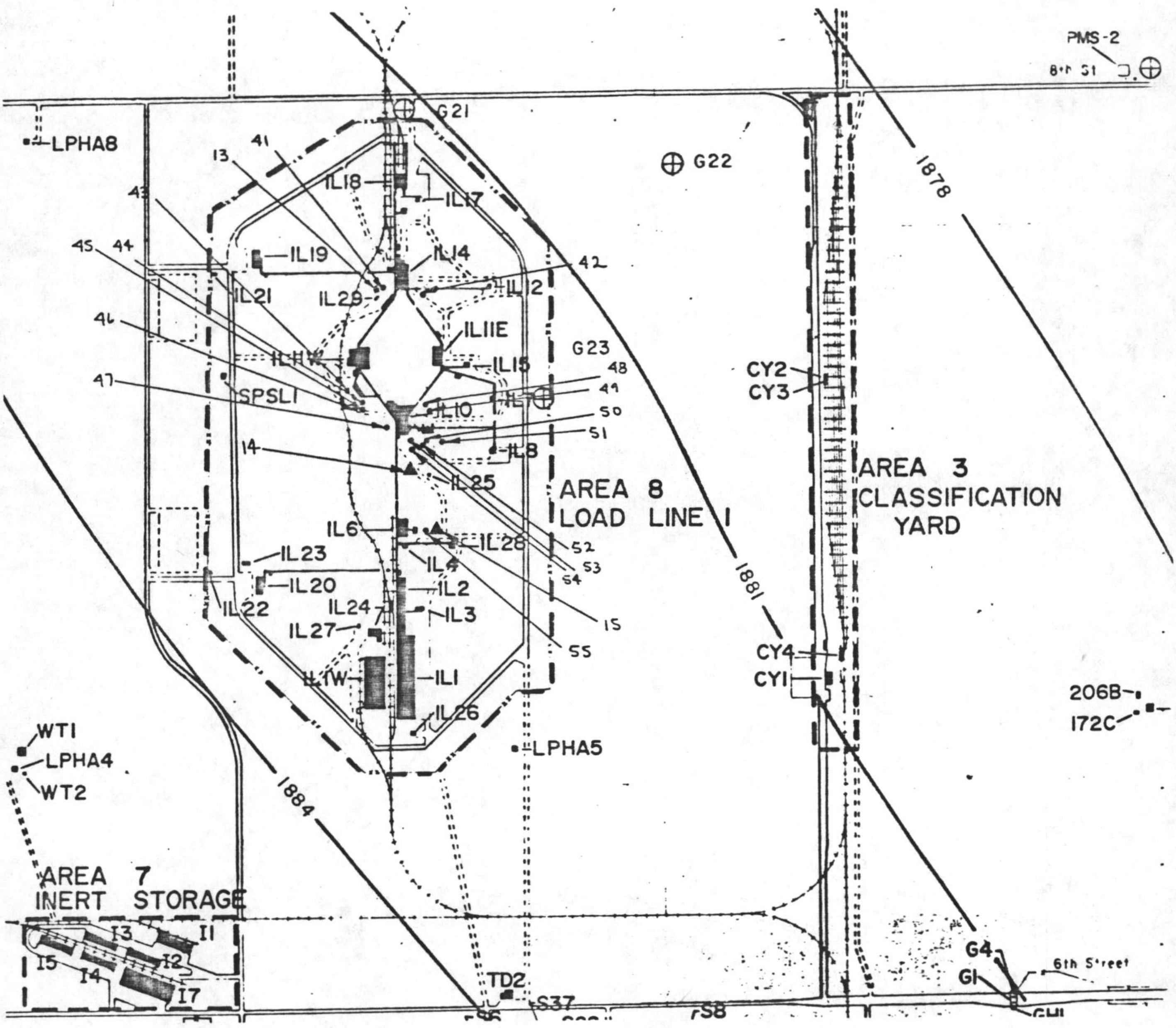
In this section, a discussion of the data is presented. This includes a review of the significance of compounds detected and attempts to relate the data between wells and possible contamination sources.

Most of the wells appeared to be clean. Several samples contained low levels of aluminum (≅100 ppb), but this level was also seen in Well G33 (which is upgradient from all sources) and in the water supply well used during certification. Nitrate was observed in a few wells not showing any other contamination; this is probably due to over-fertilization rather than migration of explosives. Well G33 contained the highest concentration (31 ppm as nitrogen) which, based on the slope of the water table, is from sources outside the installation. GC/MS data for the wells was similar. Nearly all samples contained background levels of several compounds which are seen in lab blanks. These include benzene, toluene, trichlorobenzene, trichloroethane, dichlorodifluoroethane, pentane, hexane and the phthalates at about one to two ppb. Methylene chloride is observed in samples and blanks at 10 to 30 ppb, and freon is often seen at 10 to 20 ppb. Some of the polynuclear aromatic compounds are typically seen in soil samples at one ppb or less, and the presence of two or three of these is not considered significant at these low levels.

When reviewing the GC/MS library search data, it should be kept in mind that the quantifications are only approximate and the compound listings are only probable hits, not definite identifications.

Load Line No. 1 (Wells G22, G23, G24; Soils S13, S14, S15)

Well G22 contained TNB (14 ppb) and TNT (100 ppb) as well as nitrate (21 ppm). Well G23 showed TNB (352 ppb), TNT (5,300 ppb), RDX (307 ppb), both DNTs (total 14 ppb) and nitrate (9 ppm). TNT (3 ppb) and RDX (150 ppb) were seen in Well G24, at the eastern edge of the installation.



Well No.	24DNT	26DNT	TNB	TNT	RDX
G21	--	--	--	--	117
G22	--	--	13.9	99.7	--
G23	12.4	2.0	353	5,290	307
G24	--	--	--	323	150

All results are in μg/l

Leaching Pit 14

Shallow: TNT 1,000 μg/g
Deep: TNT 76.5 μg/g
TNB 19.6 μg/g

Leaching Pit 15

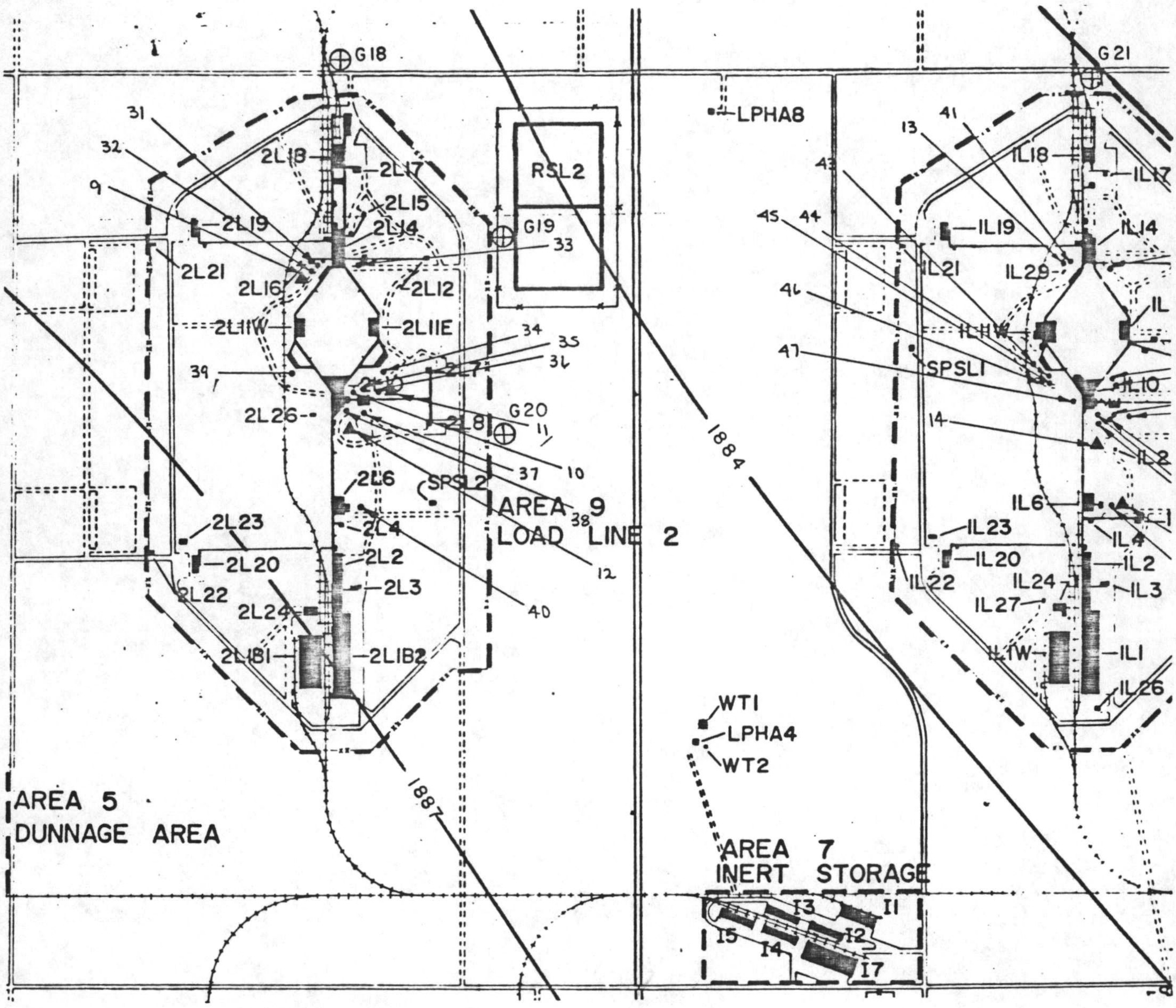
Shallow: TNT 5,100 μg/g
Deep: TNT 1,840 μg/g

⊕ G6 MONITORING WELL LOCATION AND NUMBER
• 12 CESSPOOL LOCATION AND NUMBER
△ 2 LEACHING PIT LOCATION AND NUMBER
-1881- WATER TABLE CONTOUR ELEVATION IN FEET

FIGURE 4-1
LOAD LINE I
SOURCE LOCATIONS

G21

RDX 117 μg/1



	LP9 S	LP9 D	C10 S	C10 D	LP11 S	C12 S	C12 D
4NP	1.6	--	--	--	--	--	--
HAZOB	5.6	--	--	--	--	--	--
2,4DNT	--	--	--	--	--	8.38	26.3
2,6DNT	--	--	--	--	--	--	3.82
TNB	--	--	--	--	--	--	1,100
TNT	4,930	2,300	92.3	12.3	9.79	13,500	38,000

All results are in μg/g

LP = Leaching Pit

C = Cesspool

S = Shallow

D = Deep

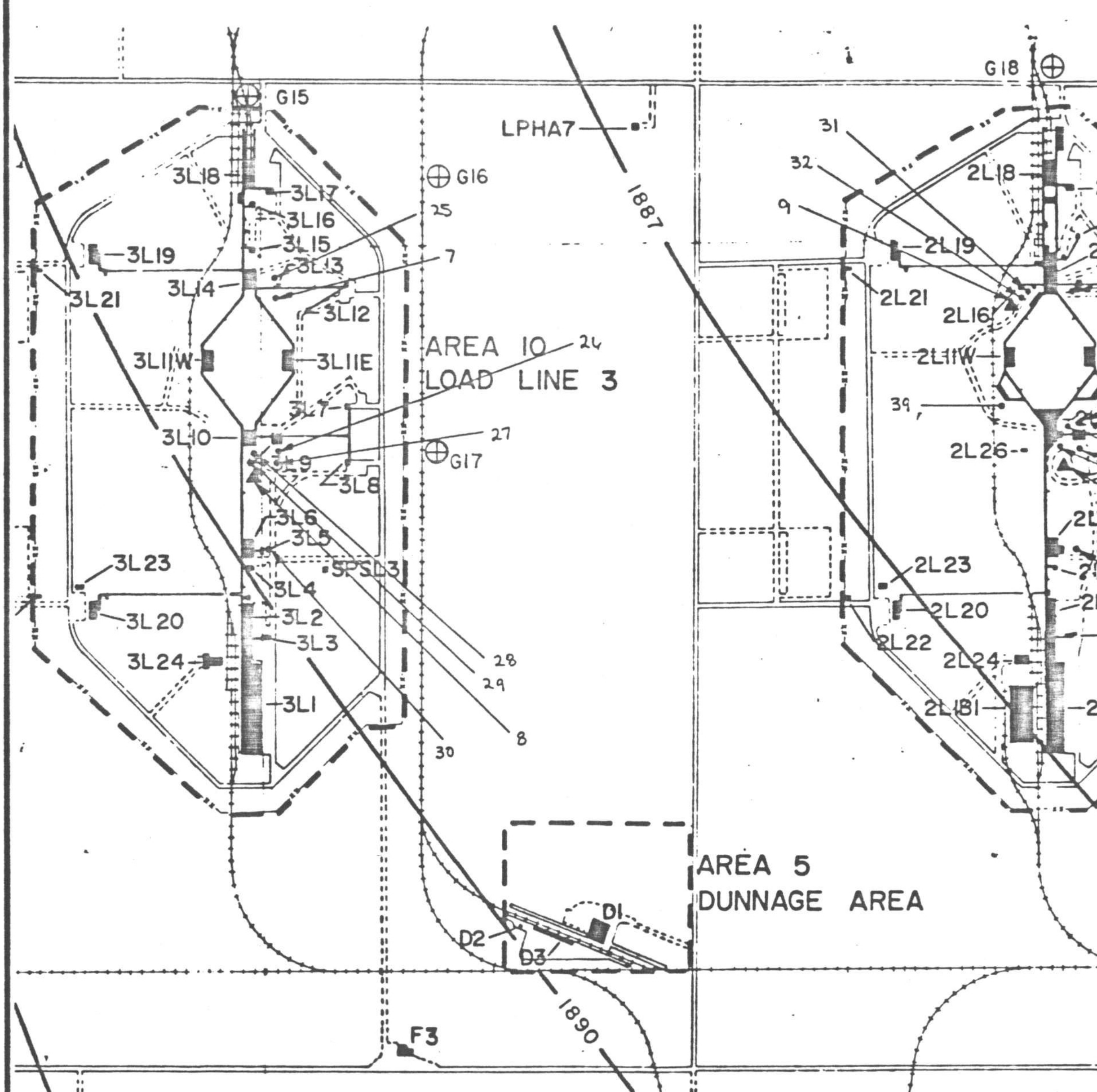
⊕ G6 MONITORING WELL LOCATION AND NUMBER

• 12 CESSPOOL LOCATION AND NUMBER

△ 2 LEACHING PIT LOCATION AND NUMBER

-1881- WATER TABLE CONTOUR ELEVATION IN FEET

FIGURE 4-2
LOAD LINE 2
SOURCE LOCATIONS



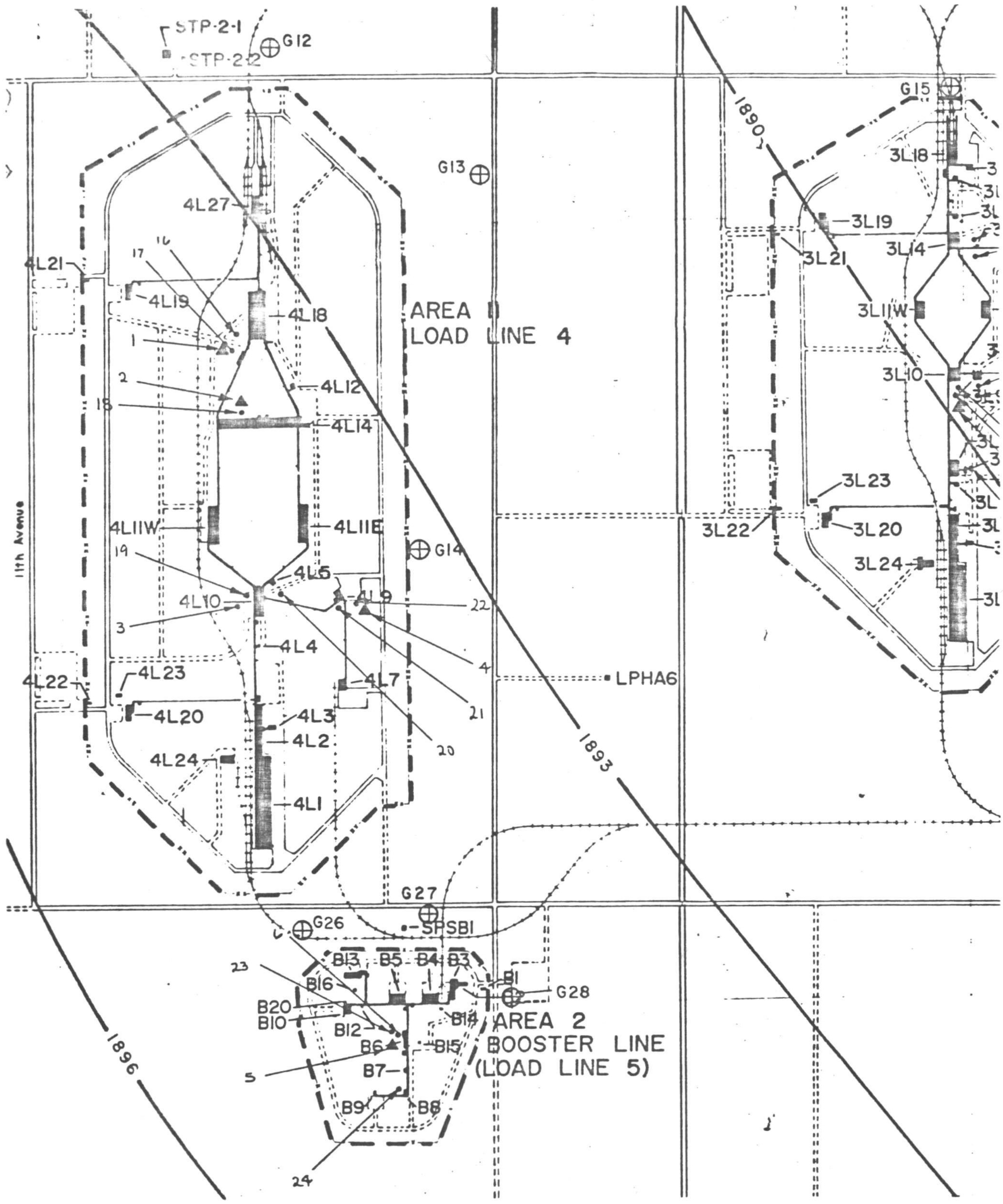
⊕ G6 MONITORING WELL LOCATION AND NUMBER

• 12 CESSPOOL LOCATION AND NUMBER

△ 2 LEACHING PIT LOCATION AND NUMBER

—1881— WATER TABLE CONTOUR ELEVATION IN FEET

FIGURE 4-3
LOAD LINE 3
SOURCE LOCATIONS



	LP1		LP2		C3		C4	C6
	S	D	S	D	D	D	S	D
4NP	40	--	--	--	--	--	--	--
2,4DNP	625	--	--	--	--	--	--	--
HAZOB	12.8	--	--	--	--	--	35.0	7.5
2,4DNT	9.08	2.94	--	--	--	--	--	--
TNB	973	162	36.7	318	13.4	20.6	51.6	34.2
TNT	23,000	2,570	2.49	923	167	38.9	--	2.31

Results are in µg/g

S = Shallow
D = Deep

LP = Leaching Pit
C = Cesspool

⊕ G6 MONITORING WELL LOCATION AND NUMBER
• 12 CESSPOOL LOCATION AND NUMBER
△ 2 LEACHING PIT LOCATION AND NUMBER
-1881- WATER TABLE CONTOUR ELEVATION IN FEET

FIGURE 4-4
LOAD LINES 4 & 5
SOURCE LOCATIONS

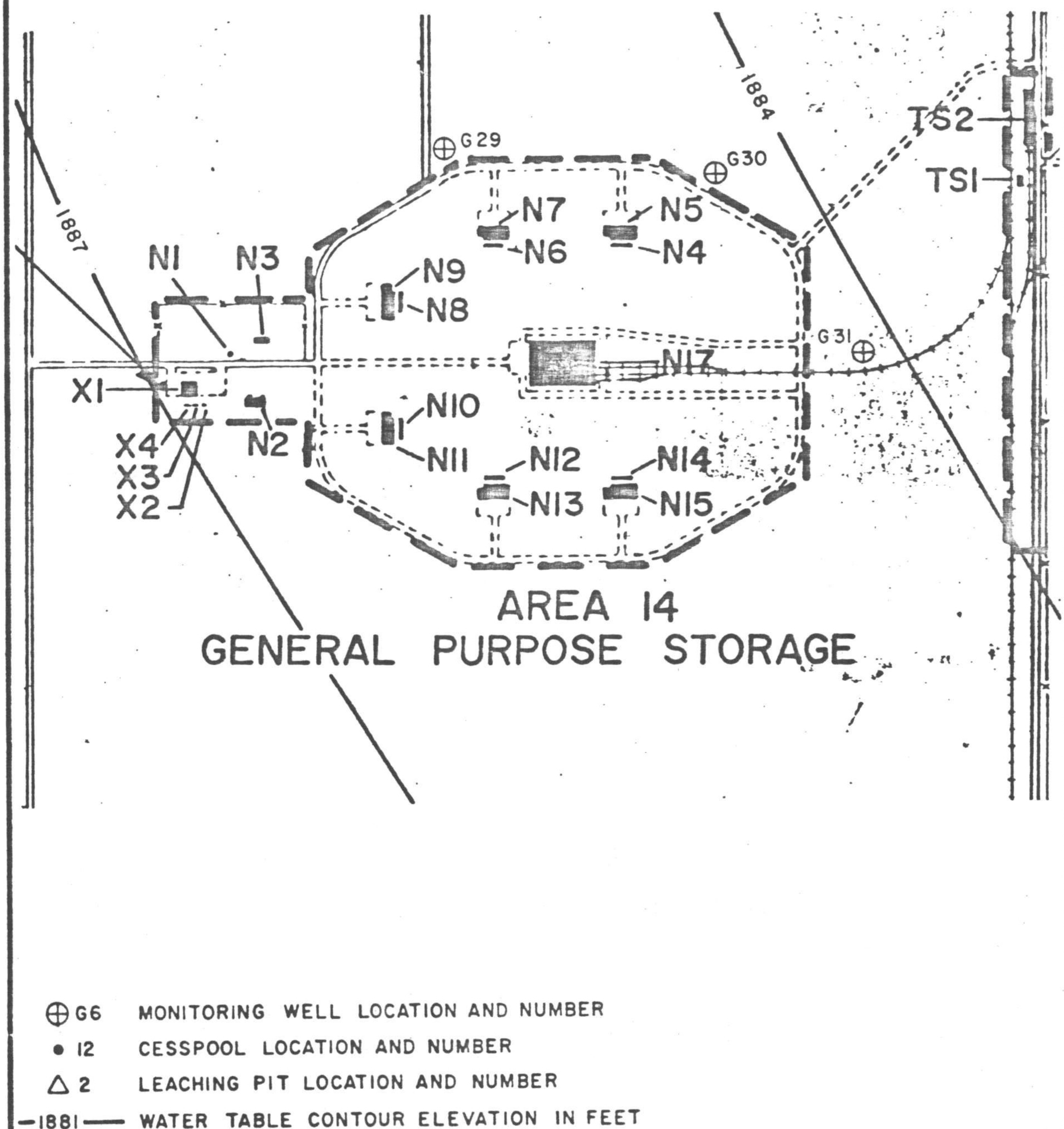


FIGURE 4-5
AMMONIUM NITRATE AREA
SOURCE LOCATIONS

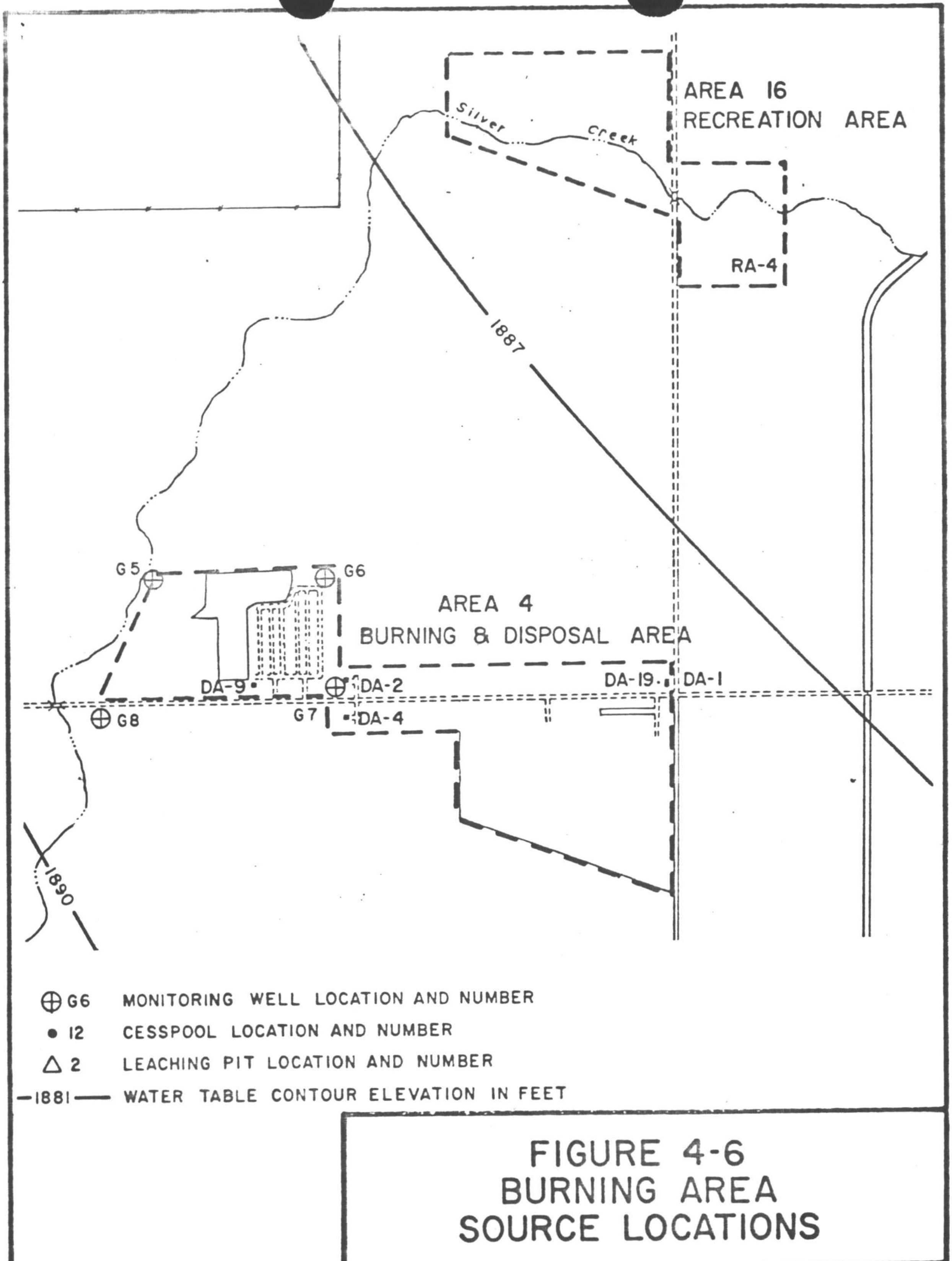


FIGURE 4-6
BURNING AREA
SOURCE LOCATIONS

The cesspools in the vicinity of Cesspool 13 (41-47 on Figure 4-1) are suggested as the probable source of the contamination in Well G22. They are upgradient from Well G22 and within the proper distance (see Chapter 3) from the well.

Leaching Pits 14 and 15, and the cesspools around them, are suggested as the most likely sources for the contamination in Wells G23 and G24. Both leaching pit sites contain TNT (shallow samples: S14 - 1,000 ppb, S15 - 5,100 ppm; deep samples: S14 - 76 ppm, S15 - 1,800 ppm) and S14 contains TNB in the deeper sample (20 ppm). No significant GC/MS compounds were detected in S13 and S14; no GC/MS analyses were performed on S15. It is probably that Well G22 is contaminated from a different source than Wells G23 and G24 since no RDX was observed in Well G22. The well placement and water table gradient support this theory.

<u>Load Line 2 (Wells G9, G10, G20, G21; Soils S9, S10, S11, S12)</u>

The only contaminants observed in these wells were nitrate (15 ppm) in Well G9 and RDX and aluminum in Well G21. Since Well G9 is beyond the minimum migration distance from the line and no other contaminants were found, it is likely that the slightly elevated nitrate content is due to over-fertilization rather than CAAP manufacturing activities. Wells G10 and G20 appear to be clean. A few compounds were detected in the GC/MS library search of Well G10 but appear not to be significant. Traces of acetone and di-tert-butyl-cresol (DTB4C) were seen during the library search. The trace of acetone is probably due to the analytical procedure in which it is used for the cleaning of glassware. The presence of a cresol compound is also felt to be insignificant due to its presence in only upgradient background wells. Its presence due to the sampling procedure is possible as this type of compound is used as an antioxidant in resins and plasticizers. Based on migration time, flow direction and soil contamination, Leaching Pit 12 and the cesspools around them (34-39 on Figure 4-2), are the most likely source for RDX in Well G21. No GC/MS analyses were performed on Wells G9, G20 or G21. As discussed in the Geotechnical Report, Wells G18 and G19 are not downgradient from any of the cesspools or leaching pits.

All four soil sites were contaminated with explosives. Leaching pit 12 had the highest level of contamination with 13,500 ppm TNT in the upper portion and 38,000 ppm TNT in the bottom portion. TNB (1,100 ppb), 2,4-DNT (26 ppm), and 2,6-DNT (4 ppm) were also present in the deeper soil; 2,4-DNT (8 ppm) was detected in the upper soil. Leaching pit S9 showed the next highest concentrations of contaminants with TNT at 4,900 ppm in the upper layer and 2,300 ppm in the lower layer. GC/MS analysis of leaching pit S9 also showed DNT isomers, hydroxyazobenzene, and 4-nitrophenol at low (2 to 6 ppm) levels. The latter two compounds appear in samples showing high levels of explosives and there seems to be a correlation among the compounds (no GC/MS analyses were performed on leaching pits S11 and S12). Cesspool S10 contained a lower level of TNT (92 ppm). The library search confirmed the presence of TNT in the cesspool.

Load Line 3 (Wells G4, G9, G10, G16, G17, G18; Soils S7, S8)

Wells G4 and G18 were not contaminated; Well G9 was discussed under Load Line 1 (contained nitrate). Well G16 contained 2,4-DNT (3.3 ppb) and TNT (1.6 ppb) as well as the compound, hydroxyazobenzene (33 ppb). Dioctyladipate, a plasticizer, was seen at 130 ppb and may or may not be another indication of contamination as indicated in discussions in Chapter 2.

The most likely sources for the contamination in Well G16 are Cesspools S7 and S25. These cesspools were excavated into the permeable soil and are more directly upgradient from Well G16 than the other possible sources. Cesspool S7 contained TNT (13 ppm), hydroxyazobenzene (7 ppm), and several polynuclear aromatics in the shallow sample. These were detected at trace levels (0.1 to 0.3 ppm) but there were more compounds present than in other samples.

Well G17 is directly downgradient from Cesspool 30 and contained explosives. The sample from Well G17 contained 14 ppb of TNB and 9.2 ppb of TNT. Since this well is relatively near Leaching Pit S8 and only slightly southeast of the 20° wide theoretical contamination plume originating at S8, Leaching Pit S8 and Cesspools 26-29 are other possible sources of the contamination found in Well G17. Leaching Pit S8 contained TNT (26 ppm) as well as several unidentified compounds observed during the library search at low levels in the shallow sample.

Load Line 4 (Wells G3, G4, G9, G12, G13, G14, G15, G16; Soils S1, S2, S3, S4)

Wells G4, G9 and G16 were previously discussed. The other wells were not contaminated. The only well analyzed by GC/MS was G13. The library search showed low (<10 ppb) levels of two alcohols which are probably not related to any installation source. The wells probably show no contamination because the leaching pits and cesspools may not have been excavated into the permeable soil. The fine grained soil in the bottoms of the leaching pits may have limited the quantity of contaminated water which reached the water table.

High concentrations of TNT (23,000 ppm), TNB (1,000 ppm), and 2,4-dinitrophenol (600 ppm); and lower concentrations of 2,4-DNT (9 ppm), 4-nitrophenol (40 ppm), hydroxyazobenzene and a DNT isomer were observed in Leaching Pit S1. Leaching Pit S2 contained TNT and TNB at lower levels. TNT and TNB were found in the lower portions of Cesspool S3 and Leaching Pit S4. The GC/MS library search detected no significant compounds; the diacetone alcohol is a by-product of the extraction procedure.

Load Line 5 (Wells G26, G27, G28, G9, G10, G17, G18, G19, G21; Soils S5, S6)

The first two wells (G26 and G27) are located near the line but are not located directly downgradient from the potential sources. Well G28 is downgradient from Cesspool 24, but nothing of any significance was detected in these three wells.

Wells G9, G10, G18 and G21 were discussed in previous sections. These are closer to other sources of contamination and more likely contaminated by these sources than the leaching pit and/or cesspool in Line 5. Well G19, which is located way beyond the estimated minimum migration from Cesspool S6, did not contain any explosives. The GC/MS analysis showed low levels (<10 ppb) of fatty acids or esters and di-tertbutyl cresol which was seen in other wells (see discussion of Load Line 2). Well G17 is downgradient from both Leaching Pit S5 and Cesspool S6, but as discussed earlier, Leaching Pit S8 is a more likely source of the contamination found in G17.

The soils samples from Leaching Pit S5 did not contain any explosives, and no compounds of interest were seen in the library search. A siloxy compound (DBTSPY) and diacetone alcohol were probably introduced during the extraction or analytical procedure. Dimethylpolysiloxane is sometimes observed as a bleed-off compound when chromatography columns incorporating a methyl silicon rubber phase are used. In addition, siloxy compounds can be introduced through the silicon rubber septa used in the injection port of a gas chromatograph. Diacetone alcohol commonly appears when acetone is used in the soxhlet extraction of soils where it undergoes aldol condensation.

The soils samples from Cesspool S6 contained TNB, TNT and a small amount of hydroxyazobenzene. Other compounds detected in the GC/MS library search include diacetone alcohol (a by-product of the extraction), ethylhexadiene, cyclopentane carboxaldehyde and several unidentifiable peaks. The identified peaks are not considered significant in terms of contamination.

Ammonium Nitrate Area (Wells G25, G29, G30, G31)

Wells G29, G30 and G31 border the area on the north, northeast and east, respectively, with G25 located about 1,000 meters northeast (downgradient) along the border of the installation. Well G29 contained 9 ppm of nitrate which may be due to over-fertilization or is originating from the off-site source for G33. No GC/MS analyses were performed on this well or G31. The GC/MS results for G25 and G29 showed no compounds of interest.

Burning Area (Wells G2, G5, G6, G7 and G8)

Wells G2 and G6 are located downgradient from the area. Well G2 was clean, showing only background levels of GC/MS priority pollutants and a trace of di-tert-butylcresol (probably sampling contamination - see discussion of Load Line 2). However, Well G6 at the northeast corner of the area contained a large amount (2,500 ppb) of Freon-113 (trichlorotrifluoroethane) and trifluorodichloroethane (31 ppb), an unusual type of freon. The low levels of Freon-113 observed in most of the samples were probably due to laboratory contamination since this freon is used as a cleaning solvent. The Freon-113 level in Well G6 is much higher than in any other sample, however, and it is doubtful that all of it could be attributed to laboratory contamination. To verify the sample contained freon, the well was re-sampled and analyzed for Freon-113 and trifluorodichloroethane. This analysis confirmed the presence of a high concentration of Freon-113 along with a small amount of the trifluorodichloroethane. The second freon compound may be an impurity of Freon-113. Freon is used as a commercial refrigerant, an aerosol propellant, a blowing agent for plastic foams, and in anti-personnel mines disposed of at the Burning Area. There was also a small amount (4 ppb) of a compound identified as dihydrobenzopyran in Well G6. However, the library match is not very good.

Wells G5, G8 and G7 are located at the northwest, southwest and southeast corners of the burning area, respectively. No explosives were detected in G5 or G8 and none of these wells were analyzed by GC/MS. Well G7 contained some TNB (2.45 ppb), most likely from the burning ground.

Wells Not Associated with Sources (Wells G1, G11, G32, G33)

These wells are located at the northwestern, western, southwestern and southern borders of the installation. With the possible exception of G1, they are generally upgradient from any potential source of contamination. G1, G11 and G32 are free of explosives. Well G11 was analyzed by GC/MS and the library search showed only trace amounts of several compounds similar to those seen in other wells, and considered artifacts of the sampling and analysis procedure or background and not related to industrial activities at CAAP.

Well G33 contained 31 ppm of nitrate as well as a small amount of di-tertbutyl cresol tetrahydrofuran, and dioctyladipate (12.7 ppb). The nitrate is probably coming from a feedlot or other off-site source. The other compounds are probably contaminants introduced during sampling or by well construction materials. However, dioctyladipate was found only in one other well (16) where it was associated with contamination by 2,4-DNT, 4-hydroxyazobenzene and TNT. Therefore, it presence in G33 should not be dismissed as an artifact.

CHAPTER 5

CONCLUSIONS

GROUNDWATER FLOW SYSTEM

Groundwater in the shallow sand and gravel aquifer at CAAP flows to the northeast. The direction of flow is very uniform across the site with only a few minor variations. The rate of flow appears to range between 29 and 120 meters per year. This means that groundwater contamination near the northern and eastern boundaries of the plant will migrate off-site more quickly than contamination located further south and west.

CONTAMINATION SOURCES

Several of the leaching pits and cesspools do not presently have monitoring wells located directly downgradient from them. This means that it cannot presently be determined whether groundwater contamination is a general problem at CAAP, with contamination plumes extending downgradient from nearly every leaching pit and cesspool, or if groundwater contamination is limited to a few, localized areas.

ORIGIN OF SOME CONTAMINATION UNCLEAR

More than one interpretation can be made of the groundwater contamination data, especially for wells located east and north of Load Line No. 1. Depending on the angle of dispersion of the contaminants and the exact rate and path of movement, the theoretical contamination plumes extending from the leaching pits and cesspools in Load Line 1 overlap in the vicinity of the contaminated wells. The exact source or sources of the contamination, therefore, cannot be determined.

PRESENCE OF FINE GRAINED SOILS AT SOURCES

Based on the lack of contamination found downgradient from sources in Load Lines 4 and 5, it appears that the generally thicker fine grained soils in this vicinity of CAAP were effective in limiting the quantity of contaminated water that entered the shallow aquifer from the leaching pits and cesspools located in these load lines. Some contaminated water from these leaching pits and cesspools probably entered the shallow aquifer due to their configuration and method of operation. However, the quantity of contaminated water was apparently small enough to allow dilution and natural dispersion to prevent contamination of the aquifer from these sources.

CONTAMINATION OF SOILS AND SEDIMENTS

The analytical results show that the soil in the bottoms of most cesspools and leaching pits are contaminated with explosives, their manufacturing by-products and their environmental degradation products (Tables 2-8 and 2-9). No significant contaminants were found in Leaching Pit S5 (Load Line 5) and Cesspool S13 (Load Line 1). Some of the soil samples showed contaminant concentrations increasing with depth, where at other sites, contaminants decreased with depth. Since a reverse contaminant gradient was demonstrated at several locations, the lack of detectable shallow contamination does not preclude the possibility of deeper contamination.

POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

In general, it can be concluded that these cesspools and leaching pits, during past active operation, have served as point sources for groundwater contamination and have the potential for continuing to do so during the current inactive status.

The geometry of the leaching pits is such that they would tend to collect precipitation. This precipitation is then available to leach contaminants out of the contaminated soil and transport these contaminants into the groundwater flow system. Vegetation growing in pit bottoms would tend to decrease the quantity of water available for leaching through transpiration. This effect would be enhanced by the higher moisture retention capacity of fine grained soils present in the bottoms of most of the leaching pits.

The relative size and geometry of the cesspools are such that they would tend to collect less precipitation than the leaching pits. Most of the precipitation collected probably leaches through the contaminated soil and recharges groundwater since evapotranspiration from the bottoms of the cesspools is probably negligible. Therefore, it is believed that the contaminated soils in the bottoms of the leaching pits and cesspools may be acting as a continued source of groundwater contamination, although at a much reduced rate compared to the probable rate which occurred during operation of these areas.

CONTAMINATION OF GROUNDWATER

It can be concluded that the shallow aquifer at CAAP has been contaminated by past manufacturing activities. The analytical results show that a number of the monitoring wells at CAAP have significant levels of contamination from explosives, their manufacturing by-products and their environmental degradation products (Tables 2-8 and 2-9). Wells in which significant levels of these contaminants were found included Wells G7, G9, G12, G16, G17, G18, G21, G22, G23, G24, G29 and G33. In addition, a significant level of Freon-113 was found in Well G6 by GC/MS.

MOVEMENT OF CONTAMINANTS OFF-SITE

It is concluded that groundwater contamination has moved off-site at one location. Well G24 at the eastern boundary of the facility showed a concentration of 323 μg/l TNT and 150 μg/l RDX.

SOURCES AND EXTENT OF GROUNDWATER CONTAMINATION

Some of the cesspools and leaching pits in Load Lines 1, 2 and 3 have contaminated the shallow aquifer with explosive compounds. The cesspools and leaching pits in Load Lines 4 and 5, and in the ammonium nitrate area have apparently not contaminated the shallow aquifer. Operations at the Burning Area have contaminated the shallow aquifer with explosive compounds and freon.

Operations at Load Lines 1, 2 and 3 appear to have been the major sources of groundwater contamination at CAAP. Based on the known contamination, it appears that the total areal extent of the groundwater contamination emanating from these three load lines encompasses about one square mile within the site boundary. Envirodyne estimates that a considerably smaller area off-site has been contaminated.

No well nests or deeper monitoring wells were installed at CAAP, and, therefore, the vertical extent of the groundwater contamination is presently unknown. However, it is possible that the full vertical extent of the shallow aquifer (15 to 30 meters) has been contaminated to some degree since there is very little clay in this aquifer to retard vertical mixing. Contamination of the underlying Ogallala Formation (aquifer) is unlikely due to the intervening 15 to 37 meters of Quaternary silt and clay (see Chapter 3 of the Geotechnical Report).

As shown in Table 2-8, the groundwater downgradient from Load Line 1 seems to have higher concentrations of contaminants and more widespread contamination than the groundwater downgradient from Load Lines 2 and 3. Likewise, contamination emanating from Load Line 2 seems to be more extensive and at greater concentrations than that emanating from Load Line 3. This apparent concentration gradient that decreases from east to west seems to be related to the number of cesspools and leaching pits. Load Line 1 has 2 leaching pits and 16 cesspools; Load Line 2 has 3 leaching pits and 10 cesspools; and Load Line 3 has 1 leaching pit and 7 cesspools. This relationship does not continue for Load Line 4 (3 leaching pits and 8 cesspools), but at Load Line 4 the thicker surficial fine grained soils probably have limited the contamination as discussed earlier in the chapter.

CHAPTER 6

RECOMMENDATIONS

DEEPER SOIL SAMPLING

Deeper soil samples should be taken at several of the cesspools and leaching pits (down to groundwater) to define the extent of vertical migration of high concentrations of contaminants and to verify whether or not the sites continue to be sources of groundwater contamination.

CHEMICAL ANALYSIS

If additional sampling is conducted, quantitative methods should be developed and samples analyzed for the five significant parameters revealed by the GC/MS screening analysis (namely: hydroxyazobenzene; 2-nitrophenol; 2,4-dinitrophenol; dioctyladipate; and, Freon-113).

SIGNIFICANCE OF FREON-113 IN GROUNDWATER

It is recommended that a determination be made of the environmental significance of Freon-113 in groundwater and the corresponding concentration of concern.

CONTROL TECHNOLOGY DEVELOPMENT PROGRAM

It is recommended that a Control Technology Development Program be considered to evaluate engineering corrective measures relative to the contaminated aquifer.

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APPENDIX A

GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

KEY TO DATA TABLES:

Site Identification -

GOOXX - well sample
G10X - background well sample
Soils XX - soil sample
Soils 100 - background soil
a letter and three numbers and 0.000 - duplicate of sample on previous line

Sample Number - three letters and three numbers. Second letter correlates to parameter (all nitroaromatics in water are BA , all GCMS acid and base/neutrals in soil are BG . The third letter indicates lot. The numbers identify each sample within a lot.

Sample Depth -

Wells - depth in centimeters to the top of the water table at time of sampling

Soil - 0 (zero) indicates the top of the 0 - 46 cm interval
46 indicates the top of the 46 - 91 cm interval

Analysis Date - date the analysis was initiated, i.e. the digestion date for metals, extraction date for organics

Parameter Test Name - see Appendix for explanation of codes

Boolean - LT = less than Hubaux and Vos detection limit
GT = greater than (sample overloaded detector)

Mantissa and Exponent - the analytical result corrected by the accuracy expressed in scientific notation. The exponent applies to the spike amount in the site identification column as well as the precision value.

Unit - all water results are ug/l (ppb), all soils are ug/g (ppm) dry weight.
An "S" at the end indicates results of GCMS library search with the approximate concentration calculated using the internal standard as standard.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
ACET	G0010	BDB008	450	82012	82025		8.860	+01	UGLS	000.	999.
ALHMW	SOILS10	BHA008	-0	82009	82091		8.800	+00	UGGS	000.	999.
ANTRC	SOILS07	BHA005	-0	82011	82024		3.000	-01	UGG	000.	999.
BAANTR	SOILS01	BHA001	-0	82011	82024		1.000	-01	UGG	000.	999.
BAANTR	SOILS03	BHA002	-0	82011	82024	LT	1.000	-01	UGG	000.	999.
BAANTR	SOILS07	BHA005	-0	82011	82024		3.000	-01	UGG	000.	999.
BAANTR	SOILS10	BHA008	-0	82009	82024		3.000	-01	UGG	000.	999.
BAHXE	G0011	BEA005	499	82008	82056		3.100	+00	UGLS	000.	999.
BAHXE	G0013	BEA007	564	82008	82056		1.260	+01	UGLS	000.	999.
BAPYR	SOILS07	BHA005	-0	82011	82024		2.000	-01	UGG	000.	999.
BBZP	SOILS07	BHA005	-0	82011	82024		2.000	-01	UGG	000.	999.
B2FANT	SOILS07	BHA005	-0	82011	82024		3.000	-01	UGG	000.	999.
B2EHP	G0002	BDB006	487	82012	82025	LT	1.000	+00	UGL	000.	999.
B2EHP	G0004	BDB007	519	82012	82025	LT	1.000	+00	UGL	000.	999.
B2EHP	G0006	BDA006	395	82010	82022	LT	1.000	+00	UGL	000.	999.
B2EHP	G0010	BDB008	450	82012	82025	LT	1.000	+00	UGL	000.	999.
B2EHP	G0016	BDB002	627	82007	82025		4.500	+01	UGL	000.	999.
B2EHP	G0019	BDB003	600	82007	82025	LT	1.000	+00	UGL	000.	999.
B2EHP	G0022	BDA003	527	82012	82021	LT	1.000	+00	UGL	000.	999.
B2EHP	G0027	BDB004	722	82008	82025		1.000	+00	UGL	000.	999.
B2EHP	G0030	BDA004	644	82006	82021	LT	1.000	+00	UGL	000.	999.
B2EHP	G0033	BDB005	620	82008	82025		4.000	+00	UGL	000.	999.
B2EHP	SOILS01	BHA001	-0	82011	82024		7.000	-01	UGG	000.	999.
B2EHP	SOILS03	BHA002	-0	82011	82024		1.000	-01	UGG	000.	999.
B2EHP	SOILS05	BHA003	-0	82011	82024		2.100	+00	UGG	000.	999.
B2EHP	SOILS06	BHA004	-0	82011	82024		7.000	-01	UGG	000.	999.
B2EHP	SOILS06	BHA004	-0	82011	82091		1.300	+00	UGGS	000.	999.
B2EHP	SOILS07	BHA005	-0	82011	82024		2.000	+00	UGG	000.	999.
B2EHP	SOILS08	BHA006	-0	82009	82024		4.000	-01	UGG	000.	999.
B2EHP	SOILS09	BHA007	-0	82009	82024		5.000	-01	UGG	000.	999.
B2EHP	SOILS10	BHA008	-0	82009	82024		6.000	-01	UGG	000.	999.
B2EHP	SOILS13	BHA009	-0	82009	82024		1.000	-01	UGG	000.	999.
B2EHP	SOILS14	BHA010	-0	82009	82024		1.000	-01	UGG	000.	999.
CALLMW	G0022	BDA003	527	82012	82021		5.250	+01	UGLS	000.	999.
CALLMW	SOILS01	BHA001	-0	82011	82091		1.200	+00	UGGS	000.	999.
CALLMW	SOILS05	BHA003	-0	82011	82091		4.300	+00	UGGS	000.	999.
CALLMW	SOILS06	BHA004	-0	82011	82091		2.400	+00	UGGS	000.	999.
CALLMW	SOILS07	BHA005	-0	82011	82077		3.200	+00	UGGS	000.	999.
CALLMW	SOILS08	BHA006	-0	82009	82091		2.600	+00	UGGS	000.	999.
CALLMW	SOILS09	BHA007	-0	82009	82091		3.100	+00	UGGS	000.	999.
CALLMW	SOILS10	BHA008	-0	82009	82091		5.700	+00	UGGS	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
CALLMW	SOILS14	BHA010	-0	82009	82091		1.300	+01	UGGS	000.	999.
CCL2F2	G0002	BDB006	487	82012	82025		7.800	+01	UGL	000.	999.
CCL2F2	G0006	BDA006	395	82010	82022		4.000	+00	UGL	000.	999.
CCL2F2	G0006	BDA006	395	82010	82022		5.500	+00	UGLS	000.	999.
CCL2F2	G0011	BDA005	499	82008	82021		4.400	+01	UGL	000.	999.
CCL2F2	G0011	BDA005	499	82008	82021		4.240	+01	UGLS	000.	999.
CCL2F2	G0013	BDA007	564	82008	82025		2.700	+01	UGL	000.	999.
CCL2F2	G0013	BDA007	564	82008	82025		2.440	+01	UGLS	000.	999.
CCL2F2	G0019	BDB003	600	82007	82025		2.100	+01	UGL	000.	999.
CCL2F2	G0030	BDA004	644	82006	82021		5.000	+01	UGLS	000.	999.
CCL2F2	G0030	BDA004	644	82006	82021		5.400	+01	UGL	000.	999.
CH2CL2	G0002	BDB006	487	82012	82025		1.100	+01	UGL	000.	999.
CH2CL2	G0004	BDB007	519	82012	82025		1.000	+00	UGL	000.	999.
CH2CL2	G0006	BDA006	395	82010	82022		1.100	+01	UGL	000.	999.
CH2CL2	G0011	BDA005	499	82008	82021		1.100	+01	UGL	000.	999.
CH2CL2	G0013	BDA007	564	82008	82025		8.000	+00	UGL	000.	999.
CH2CL2	G0016	BDB002	627	82007	82025		1.000	+01	UGL	000.	999.
CH2CL2	G0019	BDB003	600	82007	82025		1.000	+01	UGL	000.	999.
CH2CL2	G0022	BDA003	527	82012	82021		1.400	+01	UGL	000.	999.
CH2CL2	G0025	BDA002	576	82006	82021		1.200	+01	UGL	000.	999.
CH2CL2	G0027	BDB004	722	82008	82025		1.100	+01	UGL	000.	999.
CH2CL2	G0030	BDA004	644	82006	82021		1.400	+01	UGL	000.	999.
CH2CL2	G0033	BDB005	620	82008	82025		1.000	+01	UGL	000.	999.
CPCXAL	SOILS01	BHA001	-0	82011	82083		9.200	+00	UGGS	000.	999.
CPCXAL	SOILS06	BHA004	-0	82011	82083		1.880	+01	UGGS	000.	999.
C16A	G0016	BEB002	627	82007	82074		1.500	+00	UGLS	000.	999.
C16A	G0019	BEB003	600	82007	82074		2.900	+00	UGLS	000.	999.
C6H6	G0002	BDB006	487	82012	82025		1.000	+00	UGL	000.	999.
C6H6	G0004	BDB007	519	82012	82025		1.000	+00	UGL	000.	999.
C6H6	G0006	BDA006	395	82010	82022		2.000	+00	UGL	000.	999.
C6H6	G0010	BDB008	450	82012	82025		2.000	+00	UGL	000.	999.
C6H6	G0011	BDA005	499	82008	82021		2.000	+00	UGL	000.	999.
C6H6	G0013	BDA007	564	82008	82025		1.000	+00	UGL	000.	999.
C6H6	G0016	BDB002	627	82007	82025		1.000	+00	UGL	000.	999.
C6H6	G0019	BDB003	600	82007	82025		1.000	+00	UGL	000.	999.
C6H6	G0022	BDA003	527	82012	82021		2.000	+00	UGL	000.	999.
C6H6	G0025	BDA002	576	82006	82021		1.000	+00	UGL	000.	999.
C6H6	G0027	BDB004	722	82008	82025		1.000	+00	UGL	000.	999.
C6H6	G0030	BDA004	644	82006	82021		1.000	+00	UGL	000.	999.
C6H6	G0033	BDB005	620	82008	82025		1.000	+00	UGL	000.	999.
DBTSPT	SOILS05	BHA003	-0	82011	82091		4.100	+00	UGGS	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
DBTSPY	SOILS08	BHA006	-0	82009	82091	LT	1.000	+00	UCGS	000.	999.
DEP	G0002	BDB006	487	82012	82025		7.000	+00	UGL	000.	999.
DEP	G0004	BDB007	519	82012	82025		7.000	+00	UGL	000.	999.
DEP	G0006	BDA006	395	82010	82022		2.000	+00	UGL	000.	999.
DEP	G0010	BDB008	450	82012	82025		6.000	+00	UGL	000.	999.
DEP	G0016	BDB002	627	82007	82025		5.000	+00	UGL	000.	999.
DEP	G0019	BDB003	600	82007	82025		6.000	+00	UGL	000.	999.
DEP	G0022	BDA003	527	82012	82021		1.000	+00	UGL	000.	999.
DEP	G0027	BDB004	722	82008	82025		5.000	+00	UGL	000.	999.
DEP	G0030	BDA004	644	82006	82021		1.000	+00	UGL	000.	999.
DEP	G0033	BDB005	620	82008	82025		7.000	+00	UGL	000.	999.
DEP	SOILS01	BHA001	-0	82011	82024		2.000	-01	UGG	000.	999.
DEP	SOILS03	BHA002	-0	82011	82024		5.000	-01	UGG	000.	999.
DEP	SOILS06	BHA004	-0	82011	82024	LT	1.000	-01	UGG	000.	999.
DEP	SOILS07	BHA005	-0	82011	82024		8.000	+00	UGG	000.	999.
DEP	SOILS08	BHA006	-0	82009	82024		4.000	-01	UGG	000.	999.
DEP	SOILS10	BHA008	-0	82009	82024		2.000	-01	UGG	000.	999.
DEP	SOILS13	BHA009	-0	82009	82024		1.000	+00	UGG	000.	999.
DEP	SOILS14	BHA010	-0	82009	82024		2.000	-01	UGG	000.	999.
DNBZPY	G0006	BEA006	450	82010	82047		3.700	+00	UGLS	000.	999.
DNBZPY	G0011	BEA005	499	82008	82047		3.300	+00	UGLS	000.	999.
DIACAL	SOILS03	BHA002	-0	82011	82083		1.010	+02	UGGS	000.	999.
DIACAL	SOILS05	BHA003	-0	82011	82083		3.300	+01	UGGS	000.	999.
DIACAL	SOILS06	BHA004	-0	82011	82083		3.150	+01	UGGS	000.	999.
DMP	G0002	BDB006	487	82012	82025	LT	1.000	+00	UGL	000.	999.
DMP	G0004	BDB007	519	82012	82025	LT	1.000	+00	UGL	000.	999.
DMP	G0033	BDB005	620	82008	82025	LT	1.000	+00	UGL	000.	999.
DMP	SOILS03	BHA002	-0	82011	82024	LT	1.000	-01	UGG	000.	999.
DMP	SOILS13	BHA009	-0	82009	82024		1.000	-01	UGG	000.	999.
DNBP	G0002	BDB006	487	82012	82025	LT	1.000	+00	UGL	000.	999.
DNBP	G0004	BDB007	519	82012	82025	LT	1.000	+00	UGL	000.	999.
DNBP	G0006	BDA006	395	82010	82022		1.000	+00	UGL	000.	999.
DNBP	G0010	BDB008	450	82012	82025		1.000	+00	UGL	000.	999.
DNBP	G0011	BDA005	499	82008	82021	LT	1.000	+00	UGL	000.	999.
DNBP	G0016	BDB002	627	82007	82025		2.000	+00	UGL	000.	999.
DNBP	G0019	BDB003	600	82007	82025		1.000	+00	UGL	000.	999.
DNBP	G0022	BDA003	527	82012	82021		3.000	+00	UGL	000.	999.
DNBP	G0027	BDB004	722	82008	82025		2.000	+00	UGL	000.	999.
DNBP	G0030	BDA004	644	82006	82021		2.000	+00	UGL	000.	999.
DNBP	G0033	BDB005	620	82008	82025	LT	1.000	+00	UGL	000.	999.
DNBP	SOILS03	BHA002	-0	82011	82024		1.000	-01	UGG	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	RESULTS MNTSA	EXP	UNIT	ACRY	PREC
DNBP	SOILS06	BHA004	-0	82011	82024		2.000	-01	UGG	000.	999.
DNBP	SOILS07	BHA005	-0	82011	82024		6.000	-01	UGG	000.	999.
DNBP	SOILS08	BHA006	-0	82009	82024		2.000	-01	UGG	000.	999.
DNBP	SOILS10	BHA008	-0	82009	82024		1.000	-01	UGG	000.	999.
DNBP	SOILS13	BHA009	-0	82009	82024	LT	1.000	-01	UGG	000.	999.
DNBP	SOILS14	BHA010	-0	82009	82024		2.000	-01	UGG	000.	999.
DNOP	SOILS07	BHA005	-0	82011	82024		1.000	-01	UGG	000.	999.
DNTISO	SOILS01	BHA001	-0	82011	82083		8.800	+00	UGGS	000.	999.
DNTISO	SOILS01	BHA001	-0	82011	82083		6.100	+00	UGGS	000.	999.
DNTISO	SOILS09	BHA007	-0	82009	82083		4.400	+00	UGGS	000.	999.
DNTISO	SOILS09	BHA007	-0	82009	82083		3.200	+00	UGGS	000.	999.
DOAD	G0016	BEB002	627	82007	82074		1.300	+02	UGLS	000.	999.
DOAD	G0033	BEB005	620	82008	82074		1.270	+01	UGLS	000.	999.
DTB4C	G0002	BEB006	487	82012	82074		2.300	+00	UGLS	000.	999.
DTB4C	G0004	BEB007	519	82012	82074		1.700	+00	UGLS	000.	999.
DTB4C	G0010	BEB008	450	82012	82074		1.000	+00	UGLS	000.	999.
DTB4C	G0016	BEB002	627	82007	82074		2.800	+00	UGLS	000.	999.
DTB4C	G0019	BEB003	600	82007	82074		1.800	+00	UGLS	000.	999.
DTB4C	G0027	BEB004	722	82008	82074		2.100	+00	UGLS	000.	999.
DTB4C	G0033	BEB005	620	82008	82074		1.600	+00	UGLS	000.	999.
ETOH	G0002	BDB006	487	82012	82025		1.200	+00	UGLS	000.	999.
ETOH	G0004	BDB007	519	82012	82025		1.060	+01	UGLS	000.	999.
ETOH	G0019	BDB003	600	82007	82025		9.800	+00	UGLS	000.	999.
ETOH	G0033	BDB005	620	82008	82025		7.300	+00	UGLS	000.	999.
FANT	SOILS01	BHA001	-0	82011	82024		2.000	-01	UGG	000.	999.
FANT	SOILS03	BHA002	-0	82011	82024	LT	1.000	-01	UGG	000.	999.
FANT	SOILS07	BHA005	-0	82011	82024		3.000	-01	UGG	000.	999.
FANT	SOILS10	BHA008	-0	82009	82024		1.000	-01	UGG	000.	999.
FARN	G0002	BEB006	487	82012	82074		7.300	+00	UGLS	000.	999.
FARN	G0004	BEB007	519	82012	82074		2.900	+00	UGLS	000.	999.
FARN	G0010	BEB008	450	82012	82074		7.000	+00	UGLS	000.	999.
FARN	G0013	BEA007	564	82008	82056		1.800	+00	UGLS	000.	999.
FARN	SOILS05	BHA003	-0	82011	82091		2.100	+00	UGGS	000.	999.
FARN	SOILS08	BHA006	-0	82009	82091	LT	1.000	+00	UGGS	000.	999.
FARN	SOILS09	BHA007	-0	82009	82091		2.200	+00	UGGS	000.	999.
FARN	SOILS10	BHA008	-0	82009	82091		3.200	+00	UGGS	000.	999.
FARN	SOILS14	BHA010	-0	82009	82091		7.400	+00	UGGS	000.	999.
FREON	G0002	BDB006	487	82012	82025		1.920	+01	UGLS	000.	999.
FREON	G0004	BDB007	519	82012	82025		1.150	+01	UGLS	000.	999.
FREON	G0006	BDA006	395	82010	82022		2.500	+03	UGLS	000.	999.
FREON	G0010	BDB008	450	82012	82025		1.370	+01	UGLS	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	BOOL	MNTSA	EXP	UNIT	ACRY	PREC
FREON	C0011	BDA005	499	82008	82021		1.120	+01	UGLS	000.	999.
FREON	C0013	BDA007	564	82008	82025		1.550	+01	UGLS	000.	999.
FREON	C0016	BDB002	627	82007	82025		1.050	+01	UGLS	000.	999.
FREON	C0019	BDB003	600	82007	82025		1.650	+01	UGLS	000.	999.
FREON	C0022	BDA003	527	82012	82021		3.460	+01	UGLS	000.	999.
FREON	C0025	BDA002	576	82006	82021		3.640	+01	UGLS	000.	999.
FREON	C0027	BDB004	527	82012	82025		1.070	+01	UGLS	000.	999.
FREON	C0030	BDA004	644	82006	82021		3.500	+01	UGLS	000.	999.
FREON	C0033	BDB005	620	82008	82025		1.340	+01	UGLS	000.	999.
NAZOB	C0016	BEB002	627	82007	82074		3.310	+01	UGLS	000.	999.
NAZOB	SOILS01	BHA001	-0	82011	82091		1.280	+01	UGGS	000.	999.
NAZOB	SOILS06	BHA004	-0	82011	82083		3.500	+01	UGGS	000.	999.
NAZOB	SOILS07	BHA005	-0	82011	82083		7.500	+00	UGGS	000.	999.
NAZOB	SOILS09	BHA007	-0	82009	82091		5.600	+00	UGGS	000.	999.
HEXANE	C0002	BDB006	487	82012	82025		2.500	+00	UGLS	000.	999.
HEXANE	C0004	BDB007	519	82012	82025		3.000	+00	UGLS	000.	999.
HEXANE	C0006	BDA006	395	82010	82022		2.700	+00	UGLS	000.	999.
HEXANE	C0010	BDB008	450	82012	82025		4.800	+00	UGLS	000.	999.
HEXANE	C0011	BDA005	499	82008	82021	LT	1.000	+00	UGLS	000.	999.
HEXANE	C0013	BDA007	564	82008	82025		1.400	+00	UGLS	000.	999.
HEXANE	C0016	BDB002	627	82007	82025		1.900	+00	UGLS	000.	999.
HEXANE	C0019	BDB003	600	82007	82025		1.200	+00	UGLS	000.	999.
HEXANE	C0022	BDA003	527	82012	82021	LT	1.000	+00	UGLS	000.	999.
HEXANE	C0025	BDA002	576	82006	82021		1.000	+00	UGLS	000.	999.
HEXANE	C0027	BDB004	527	82012	82025		2.900	+00	UGLS	000.	999.
HEXANE	C0030	BDA004	644	82006	82021		1.200	+00	UGLS	000.	999.
HEXANE	C0033	BDB005	620	82008	82025		2.900	+00	UGLS	000.	999.
HXDECA	SOILS07	BHA005	-0	82011	82077		5.700	+00	UGGS	000.	999.
LACTBB	C0016	BEB002	627	82007	82083		1.600	+00	UGLS	000.	999.
MEC6H5	C0002	BDB006	487	82012	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0004	BDB007	519	82012	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0006	BDA006	395	82010	82022	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0010	BDB008	450	82012	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0011	BDA005	499	82008	82021	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0013	BDA007	564	82008	82025		1.000	+00	UGL	000.	999.
MEC6H5	C0016	BDB002	627	82007	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0019	BDB003	600	82007	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0022	BDA003	527	82012	82021		1.000	+00	UGL	000.	999.
MEC6H5	C0025	BDA002	576	82006	82021		1.000	+00	UGL	000.	999.
MEC6H5	C0027	BDB004	722	82008	82025	LT	1.000	+00	UGL	000.	999.
MEC6H5	C0030	BDA004	644	82006	82021		1.000	+00	UGL	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
MEC6H5	C0033	BDB005	620	82008	82025	LT	1.000	+00	UGL	000.	999.
NAP	SOILS07	BHA005	-0	82011	82024		1.000	-01	UGG	000.	999.
NAP	SOILS13	BHA009	-0	82009	82024	LT	1.000	-01	UGG	000.	999.
NECHXA	C0004	BEB007	519	82012	82082	LT	1.000	+00	UGLS	000.	999.
NECHXA	C0013	BEA007	564	82008	82057		2.000	+00	UGLS	000.	999.
ODAPDM	C0019	BEB003	600	82007	82074		3.400	+00	UGLS	000.	999.
ODECA	C0019	BEB003	600	82007	82074		5.200	+00	UGLS	000.	999.
ODECA	SOILS07	BHA005	-0	82011	82077		1.390	+01	UGGS	000.	999.
PA2HDE	C0006	BEA006	450	82010	82047	LT	1.000	+00	UGLS	000.	999.
PA2HDE	C0011	BEA005	499	82008	82047	LT	1.000	+00	UGLS	000.	999.
PA2HDE	C0016	BEB002	627	82007	82083	LT	1.000	+00	UGLS	000.	999.
PA2HDE	C0022	BEA003	527	82012	82047	LT	1.000	+00	UGLS	000.	999.
PA2HDE	C0025	BEA002	576	82006	82047		1.500	+00	UGLS	000.	999.
PA2HDE	C0030	BEA004	644	82006	82047	LT	1.000	+00	UGLS	000.	999.
PENTAN	C0002	BDB006	487	82012	82025		1.000	+00	UGLS	000.	999.
PENTAN	C0004	BDB007	519	82012	82025		1.000	+00	UGLS	000.	999.
PENTAN	C0006	BDA006	395	82010	82022		4.400	+00	UGLS	000.	999.
PENTAN	C0010	BDB008	450	82012	82025		1.000	+00	UGLS	000.	999.
PENTAN	C0011	BDA005	499	82008	82021		1.200	+00	UGLS	000.	999.
PENTAN	C0013	BDA007	564	82008	82025		1.700	+00	UGLS	000.	999.
PENTAN	C0016	BDB002	627	82007	82025		2.000	+00	UGLS	000.	999.
PENTAN	C0019	BDB003	600	82007	82025		2.100	+00	UGLS	000.	999.
PENTAN	C0022	BDA003	527	82012	82021		1.300	+00	UGLS	000.	999.
PENTAN	C0025	BDA002	576	82006	82021	LT	1.000	+00	UGLS	000.	999.
PENTAN	C0027	BDB004	527	82012	82025		1.000	+00	UGLS	000.	999.
PENTAN	C0030	BDA004	644	82006	82021		1.000	+00	UGLS	000.	999.
PENTAN	C0033	BDB005	620	82008	82025		1.000	+00	UGLS	000.	999.
PHENOL	C0025	BDA002	576	82006	82021	LT	1.000	+00	UGL	000.	999.
PHENOL	C0030	BDA004	644	82006	82021		1.000	+00	UGL	000.	999.
PIPER	C0006	BEA006	450	82010	82047		1.300	+00	UGLS	000.	999.
PIPER	C0011	BEA005	499	82008	82047		1.000	+00	UGLS	000.	999.
PYR	SOILS01	BHA001	-0	82011	82024		2.000	-01	UGG	000.	999.
PYR	SOILS03	BHA002	-0	82011	82024	LT	1.000	-01	UGG	000.	999.
PYR	SOILS07	BHA005	-0	82011	82024		4.000	-01	UGG	000.	999.
PYR	SOILS09	BHA007	-0	82009	82024		1.800	+00	UGG	000.	999.
PYR	SOILS10	BHA008	-0	82009	82024		2.000	-01	UGG	000.	999.
TCLEE	C0025	BDA002	576	82006	82021		1.000	+00	UGL	000.	999.
TCSAME	C0002	BEB006	487	82012	82074	LT	1.000	+00	UGLS	000.	999.
TCSAME	C0010	BEB008	450	82012	82074		2.000	+00	UGLS	000.	999.
TPDCLE	C0006	BDA006	395	82010	82022		3.120	+01	UGLS	000.	999.
THF	C0002	BDB006	487	82012	82025		4.500	+00	UGLS	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
THF	G0019	BDB003	600	82007	82025		1.900	+00	UGLS	000.	999.
THF	G0022	BDA003	527	82012	82021		1.050	+00	UGLS	000.	999.
THF	G0027	BDB004	527	82012	82025		1.500	+00	UGLS	000.	999.
THF	G0033	BDB005	620	82008	82025		3.100	+00	UGLS	000.	999.
THODEO	G0030	BEA004	644	82006	82056	LT	1.000	+00	UGLS	000.	999.
TNTISO	SOILS10	BHA008	-0	82009	82083		3.500	+00	UGGS	000.	999.
TRCLE	G0013	BDA007	564	82008	82025		1.000	+00	UGL	000.	999.
TRCLE	G0022	BDA003	527	82012	82021		5.000	+00	UGL	000.	999.
TRIBZ	G0002	BEB006	487	82012	82082	LT	1.000	+00	UGLS	000.	999.
TRIBZ	G0004	BEB007	519	82012	82082	LT	1.000	+00	UGLS	000.	999.
TRIBZ	G0010	BEB008	450	82012	82083		1.400	+00	UGLS	000.	999.
TRIBZ	G0016	BEB002	627	82007	82083		1.000	+00	UGLS	000.	999.
TRIBZ	G0019	BEB003	600	82007	82082	LT	1.000	+00	UGLS	000.	999.
TRIBZ	G0027	BEB004	722	82008	82083		1.400	+00	UGLS	000.	999.
TRIBZ	G0030	BEA004	644	82006	82047		1.300	+00	UGLS	000.	999.
TRIBZ	SOILS03	BHA002	-0	82011	82083		2.000	+00	UGGS	000.	999.
TRIBZ	SOILS06	BHA004	-0	82011	82083		6.300	+00	UGGS	000.	999.
TRIBZ	SOILS07	BHA005	-0	82011	82083		1.200	+00	UGGS	000.	999.
TRIBZ	SOILS08	BHA006	-0	82009	82083		1.400	+00	UGGS	000.	999.
TRIBZ	SOILS09	BHA007	-0	82009	82083	LT	1.000	+00	UGGS	000.	999.
TRIBZ	SOILS10	BHA008	-0	82009	82083	LT	1.000	+00	UGGS	000.	999.
TRIBZ	SOILS13	BHA009	-0	82009	82083	LT	1.000	+00	UGGS	000.	999.
TRIBZ	SOILS14	BHA010	-0	82009	82083	LT	1.000	+00	UGGS	000.	999.
UNK001	SOILS05	BHA003	-0	82011	82083		1.600	+00	UGGS	000.	999.
UNK002	SOILS01	BHA001	-0	82011	82083		4.200	+00	UGGS	000.	999.
UNK002	SOILS06	BHA004	-0	82011	82083		4.300	+00	UGGS	000.	999.
UNK003	SOILS06	BHA004	-0	82011	82083		5.900	+00	UGGS	000.	999.
UNK004	SOILS01	BHA001	-0	82011	82083		8.900	+00	UGGS	000.	999.
UNK004	SOILS06	BHA004	-0	82011	82083		2.400	+01	UGGS	000.	999.
UNK005	G0002	BEB006	487	82012	82082	LT	1.000	+00	UGLS	000.	999.
UNK005	G0004	BEB007	519	82012	82082		1.100	+00	UGLS	000.	999.
UNK005	G0006	BEA006	450	82010	82047		1.800	+00	UGLS	000.	999.
UNK005	G0013	BEA007	564	82008	82057	LT	1.000	+00	UGLS	000.	999.
UNK005	G0019	BEB003	600	82007	82082	LT	1.000	+00	UGLS	000.	999.
UNK005	G0027	BEB004	722	82008	82083		1.200	+00	UGLS	000.	999.
UNK006	G0002	BEB006	487	82012	82082	LT	1.000	+00	UGLS	000.	999.
UNK006	G0010	BEB008	450	82012	82083	LT	1.000	+00	UGLS	000.	999.
UNK006	G0016	BEB002	527	82007	82083	LT	1.000	+00	UGLS	000.	999.
UNK006	G0019	BEB003	600	82007	82082	LT	1.000	+00	UGLS	000.	999.
UNK006	G0027	BEB004	722	82008	82083	LT	1.000	+00	UGLS	000.	999.
UNK007	G0013	BEA007	564	82008	82057	LT	1.000	+00	UGLS	000.	999.

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

PARAMETER: GC/MS

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
UNK008	G0010	BDB008	450	82012	82025		9.800	+00	UGLS	000.	999.
UNK009	G0025	BEA002	576	82006	82056		2.600	+00	UGLS	000.	999.
UNK010	G0011	BEA005	499	82008	82056		2.900	+00	UGLS	000.	999.
UNK010	G0022	BEA003	527	82012	82056		3.400	+00	UGLS	000.	999.
UNK010	G0025	BEA002	576	82006	82056		4.800	+00	UGLS	000.	999.
UNK010	G0027	BEB004	722	82008	82074		2.900	+00	UGLS	000.	999.
UNK010	G0030	BEA004	644	82006	82056		1.600	+00	UGLS	000.	999.
UNK011	G0022	BEA003	527	82012	82056		3.200	+00	UGLS	000.	999.
UNK012	G0022	BEA003	527	82012	82056		2.000	+00	UGLS	000.	999.
UNK013	G0011	BEA005	499	82008	82056		1.240	+01	UGLS	000.	999.
UNK013	G0013	BEA007	564	82008	82056		1.090	+01	UGLS	000.	999.
UNK013	G0022	BEA003	527	82012	82056	LT	1.000	+00	UGLS	000.	999.
UNK014	G0030	BEA004	644	82006	82056		1.600	+00	UGLS	000.	999.
UNK015	G0011	BEA005	499	82008	82056		3.900	+00	UGLS	000.	999.
UNK016	G0013	BEA007	564	82008	82056		4.000	+00	UGLS	000.	999.
UNK016	G0027	BEB004	722	82008	82074		2.600	+00	UGLS	000.	999.
UNK017	G0016	BEB002	627	82007	82074		2.400	+00	UGLS	000.	999.
UNK018	G0016	BEB002	627	82007	82074		3.200	+00	UGLS	000.	999.
UNK019	G0033	BEB005	620	82008	82074	LT	1.000	+00	UGLS	000.	999.
UNK020	G0002	BEB006	487	82012	82074		2.600	+00	UGLS	000.	999.
UNK020	G0010	BEB008	450	82012	82074		2.000	+00	UGLS	000.	999.
UNK021	G0004	BEB007	519	82012	82074		5.000	+00	UGLS	000.	999.
UNK021	G0019	BEB003	600	82007	82074		4.100	+00	UGLS	000.	999.
UNK022	SOILS06	BHA004	-0	82011	82091		2.400	+01	UGGS	000.	999.
UNK023	SOILS06	BHA004	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK024	SOILS06	BHA004	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK025	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK027	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK028	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK029	SOILS05	BHA003	-0	82011	82091		1.100	+00	UGGS	000.	999.
UNK030	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK030	SOILS09	BHA007	-0	82009	82091		2.000	+00	UGGS	000.	999.
UNK031	SOILS05	BHA003	-0	82011	82091		2.000	+00	UGGS	000.	999.
UNK032	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK033	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK034	SOILS05	BHA003	-0	82011	82091	LT	1.000	+00	UGGS	000.	999.
UNK035	SOILS05	BHA003	-0	82011	82091		1.200	+00	UGGS	000.	999.
UNK036	SOILS05	BHA003	-0	82011	82091		2.700	+00	UGGS	000.	999.
UNK037	SOILS08	BHA006	-0	82009	82091		1.200	+00	UGGS	000.	999.
UNK038	SOILS08	BHA006	-0	82009	82091	LT	1.000	+00	UGGS	000.	999.
UNK039	SOILS08	BHA006	-0	82009	82091		1.100	+00	UGGS	000.	999.

PARAMETER: GC/MS

CORNHUSKER AAP - GC/MS CHEMICAL ANALYSIS RESULTS BY TEST NAME

TEST NAME	SITE IDENTIFICATION	SAMPLE NUMBER	SAMPLE DEPTH	SAMPLING DATE	ANALYSIS DATE	RESULTS BOOL	MNTSA	EXP	UNIT	ACRY	PREC
124TCB	G0011	BDA005	499	82008	82021		2.000	+00	UGL	000.	999.
124TCB	G0016	BDB002	627	82007	82025		1.000	+00	UGL	000.	999.
124TCB	G0019	BDB003	600	82007	82025		1.000	+00	UGL	000.	999.
124TCB	G0022	BDA003	527	82012	82021		2.000	+00	UGL	000.	999.
124TCB	G0025	BDA002	576	82006	82021		2.000	+00	UGL	000.	999.
124TCB	G0027	BDB004	722	82008	82025		3.000	+00	UGL	000.	999.
124TCB	G0030	BDA004	644	82006	82021		1.000	+00	UGL	000.	999.
124TCB	G0033	BDB005	620	82008	82025		2.000	+00	UGL	000.	999.
124TCB	SOILS05	BHA003	-0	82011	82024		1.400	+00	UGG	000.	999.
124TCB	SOILS07	BHA005	-0	82011	82024		1.400	+00	UGG	000.	999.
124TCB	SOILS09	BHA007	-0	82009	82024		1.800	+00	UGG	000.	999.
124TCB	SOILS10	BHA008	-0	82009	82024		2.100	+00	UGG	000.	999.
124TCB	SOILS13	BHA009	-0	82009	82024		1.000	+00	UGG	000.	999.
2B100L	G0011	BEA005	499	82008	82056		3.800	+00	UGLS	000.	999.
2B100L	G0013	BEA007	564	82008	82056		1.030	+01	UGLS	000.	999.
2CNAP	G0002	BDB006	487	82012	82025		2.000	+00	UGL	000.	999.
2CNAP	G0004	BDB007	519	82012	82025		2.000	+00	UGL	000.	999.
2CNAP	G0006	BDA006	395	82010	82022		1.000	+00	UGL	000.	999.
2CNAP	G0010	BDB008	450	82012	82025		2.000	+00	UGL	000.	999.
2CNAP	G0011	BDA005	499	82008	82021		2.000	+00	UGL	000.	999.
2CNAP	G0016	BDB002	627	82007	82025		2.000	+00	UGL	000.	999.
2CNAP	G0019	BDB003	600	82007	82025		2.000	+00	UGL	000.	999.
2CNAP	G0027	BDB004	722	82008	82025		3.000	+00	UGL	000.	999.
2CNAP	G0030	BDA004	644	82006	82021		2.000	+00	UGL	000.	999.
2CNAP	G0033	BDB005	620	82008	82025		1.000	+00	UGL	000.	999.
2CNAP	SOILS07	BHA005	-0	82011	82024		2.000	-01	UGG	000.	999.
2CNAP	SOILS13	BHA009	-0	82009	82024		1.000	-01	UGG	000.	999.
2DMPEN	G0006	BDA006	395	82010	82022	LT	1.000	+00	UGLS	000.	999.
2DMPEN	G0011	BDA005	499	82008	82021		2.000	+00	UGLS	000.	999.
2E2HPD	G0010	BEB008	450	82012	82083	LT	1.000	+00	UGLS	000.	999.
2E2HPD	G0027	BEB004	722	82008	82083	LT	1.000	+00	UGLS	000.	999.
24DNP	SOILS01	BHA001	-0	82011	82024		6.250	+02	UGG	000.	999.
24DNT	G0016	BDB002	627	82007	82025		4.000	+00	UGL	000.	999.
24DNT	SOILS01	BHA001	-0	82011	82024		1.230	+01	UGG	000.	999.
246TNT	G0022	BEA003	527	82012	82056		1.600	+01	UGLS	000.	999.
246TNT	SOILS01	BHA001	-0	82011	82091		1.660	+02	UGGS	000.	999.
246TNT	SOILS01	BHA001	-0	82011	82083		8.900	+00	UGGS	000.	999.
246TNT	SOILS09	BHA007	-0	82009	82091		3.850	+01	UGGS	000.	999.
246TNT	SOILS09	BHA007	-0	82009	82083		1.690	+01	UGGS	000.	999.
246TNT	SOILS14	BHA010	-0	82009	82083		3.000	+00	UGGS	000.	999.
26DNT	SOILS07	BHA005	-0	82011	82024	LT	1.000	-01	UGG	000.	999.

ALPHABETIC SORT BY CODES:

AACHXE	ACETIC ACID, CYCLOHEXYL ESTER
ABHC	ALPHA-BENZENEHEXACHLORIDE / ALPHA-HEXACHLOROCYCLOHEXANE
AC	HYDROGEN CYANIDE / HYDROCYANIC ACID
ACET	ACETONE
ACHE	ANTICHOLINESTERASE
ACIDIT	ACIDITY
ACPHN	ACETOPHENONE
ACROLN	ACROLEIN
ACRYLO	ACRYLONITRILE
ADHP	AMMONIUM DIHYDROGEN PHOSPHATE
AENSLF	ALPHA-ENDOSULFAN / ENDOSULFAN I
AG	SILVER
AG110	SILVER 110
AKTON	AKTON
AL	ALUMINIUM
ALAL	ALIPHATIC ALCOHOL
ALDRN	ALDRIN
ALHC	ALIPHATIC HYDROCARBON
ALHMW	ALCOHOLS (HIGH MOLECULAR WEIGHT)
ALK	ALKALINITY
ALKN	ALKANE
ALPGF	ALPHA GROSS-FIELD
ALPGL	ALPHA GROSS-LAB
ANAPNE	ACENAPHTHENE
ANAPYL	ACENAPHTHYLENE
ANIL	ANILINE
ANTRC	ANTHRACENE
AQTHK	AQUIFER THICKNESS IN CENTIMETERS
AS	ARSENIC
ASBEST	ASBESTOS
ASEXT	ARSENIC EXTRACTABLE
ASTOT	ARSENIC TOTAL
ATNBA	2,4,6-TRINITROBENZALDEHYDE
ATNT	ALPHA-TRINITROTOLUENE (OBSOLETE; USE 246TNT)
ATZ	ATRAZINE
AYLETH	ALLYL ETHER
AZACN	AZACYLONONANE
AZDRN	AZODRIN
B	BORON
BA	BARIUM
BAANTR	BENZO(A)ANTHRACENE
BAHXE	BUTANOIC ACID, 1-HEXYL ESTER
BAPYR	BENZO(A)PYRENE
BBHC	BETA-BENZENEHEXACHLORIDE / BETA-HEXACHLOROCYCLOHEXANE
BBZP	BUTYLBENZYL PHTHALATE
BCPHCE	2,2-BIS(CHLOROPHENYL) CHLOROETHYLENE DDT RELATED
BCPHE	2,2-BIS(CHLOROPHENYL) ETHYLENE DDT RELATED
BCPHM	BIS(CHLOROPHENOL) METHANE DDT RELATED
BDRN	BIDRIN
BE	BERYLLIUM
BEETO	1-(2-BUTOXYETHOXY) ETHANOL
BEGAG	BETA GAMMA GROSS
BENSLF	BETA-ENDOSULFAN / ENDOSULFAN II

BENZA	BENZANTHRONE
BENZAL	BENZALDEHYDE
BENZID	BENZIDINE
BENZOA	BENZOIC ACID
BEP	2-BUTOXYETHANOL PHOSPHATE
BETAG	BETA GROSS
BETGF	BETA GROSS-FIELD
BETGL	BETA GROSS-LAB
BE7	BERYLLIUM 7
BF?ANT	BENZO BIFLUOROANTHENE
BGHIPY	BENZO(G,H,I)PERYLENE
BIDBI	1,5-BIS(1,1-DIMETHYLETHYL)-3,3-DIMETHYLBICYCLO(3.1.0)-HEXANE-2-ONE
BLDX	BLADEX
[illegible]	BUTYLMETHYL PHTHALATE
BOD	BIOLOGICAL OXYGEN DEMAND
BPBG	BUTYLPHTHALYL BUTYLGYCOLATE
BRCLM	BROMOCHLOROMETHANE
BRDCLM	BROMODICHLOROMETHANE
BRMCIL	BROMACIL
BZ	3-QUINUCLIDINYL BENZILATE
BZALC	BENZYL ALCOHOL
BZFANT	BENZ-FLUORANTHENE
BZOTHP	BENZO(B)THIOPHENE
[illegible]	BENZENEPHOSPHONIC ACID
B2CEXM	BIS(2-CHLOROETHOXY) METHANE
[illegible]	BIS(2-CHLOROETHYL) ETHER
B2EHP	BIS(2-ETHYLHEXYL) PHTHALATE
CA	CALCIUM
CALLMW	HYDROCARBONS (ALL MOLECULAR WEIGHTS)
CAME	CARBAMIC ACID, METHYL ESTER
CAMP	CAMPHOR
CAPLCT	CAPROLACTAM / 6-AMINOHEXANOIC ACID LACTAM
CBA	O-CHLOROBENZALDEHYDE
CBCCH	CIS-1-BROMO-2-CHLOROCYCLOHEXANE
CBOA	O-CHLOROBENZOIC ACID
CCL2F2	DICHLORODIFLUOROMETHANE
CCL3F	TRICHLOROFLUOROMETHANE
CCL4	CARBON TETRACHLORIDE
CC3	XXCC3
CD	CADMIUM
CDACH	CIS-1,2-DIACETOXYCYCLOHEXANE
CDNBIS	CHLORODINITROBENZENE ISOMER
CEC	CATION EXCHANGE CAPACITY
CE144	CERIUM 144
CG	PHOSGENE / CARBONYL CHLORIDE
CHBR3	BROMOFORM
CHCL3	CHLOROFORM
CHO	1,2-CYCLOHEXANE OXIDE
CHOLA	CHOLESTANE
CHONE	CYCLOHEXANONE
CHRM	CHROMAN
CHRY	CHRYSENE
CH2CL2	METHYLENE CHLORIDE

CH3BR	BROMOMETHANE
CH3CL	CHLOROMETHANE
CIDRN	CIODRIN
CK	CYANOGEN CHLORIDE
CL	CHLORIDE
CLC6H5	CHLOROBENZENE
CLD	CHLORINE DEMAND
CLDAN	CHLORDANE
CLDEN	CHLORDENE
CLNAP	CHLORONAPHTHALENES
CLO3	CHLORATE
CLP	CHLOROPHENOLS
CLVRA	2-CHLOROVINYL ARSONIC ACID
CLXB	CHLORINATED BENZENE
CLXNAP	CHLORINATED NAPHTHALENES
CL2	CHLORINE
CL2BZ	DICHLOROBENZENES
CL2NAP	DICHLORONAPHTHALENES
CL3NAP	TRICHLORONAPHTHALENES
CL4NAP	TETRACHLORONAPHTHALENES
CL5B	PENTACHLOROBENZENE
CL5BP	PENTACHLOROBIPHENYL
CL5ET	PENTACHLOROETHANE
CL6BP	HEXACHLOROBIPHENYL
CL6BZ	HEXACHLOROBENZENE
CL6CP	HEXACHLOROCYCLOPENTADIENE
CL6ET	HEXACHLOROETHANE
CL7NB	HEPTACHLORONORBORNADIENE
CMONOX	CARBON MONOXIDE
CN	CHLOROACETOPHENONE
CO	COBALT
COD	CHEMICAL OXYGEN DEMAND
COLOR	MEASUREMENT OF COLOR
COND	SPECIFIC CONDUCTIVITY
CO3	CARBONATE
CO57	COBALT 57
CO60	COBALT 60
CPCXAL	CYCLOPENTANE CARBOXALDEHYDE
CPMS	P-CHLOROPHENYLMETHYL SULFIDE
CPMSO	P-CHLOROPHENYLMETHYL SULFOXIDE
CPMSO2	P-CHLOROPHENYLMETHYL SULFONE
CPO	CYCLOPENTANONE
CR	CHROMIUM
CRHEX	HEXAVALENT CHROMIUM
CS	CESIUM
CSOL	CRESOLS
CS137	CESIUM 137
CTSBG	TOTAL COUNTS FOR BACKGROUND
CTSSM	TOTAL COUNTS FOR SAMPLE
CU	COPPER
CUEXT	COPPER EXTRACTABLE
CUTOT	COPPER TOTAL
CX	PHOSGENE OXIME / DICHLOROFORMOXIME
CYN	CYANIDES

CYPD	CYCLOPENTADIENE
C10	DECANE
C11	HENDECANE
C12DCE	CIS-1,2-DICHLOROETHENE
C13DCP	CIS-1,3-DICHLOROPROPYLENE / CIS-1,3-DICHLOROPROPENE
C16A	HEXADECANOIC ACID / PALMITIC ACID
C16SAT	SATURATED HYDROCABONS (C16)
C17	HEPTADECANE
C18	OCTADECANE
C18AE	OCTADECANOIC ACID, ETHYL ESTER
C19	NONADECANE
C2H3CL	CHLOROETHENE / VINYL CHLORIDE
C2H5CL	CHLOROETHANE
C4HX1L	CIS-4-HEXEN-1-OL
C6D6	BENZENE-D6
C6HOH	CYCLOHEXANOL
C6H6	BENZENE
C7NB1	HEPTACHLORONORBORNENE
C8ALKP	C8 ALKYL PHENOL
C8ALTN	C8 ALKYL TETRAHYDRONAPHTHALENE
DBAHA	DIBENZO(A,H)ANTHRACENE
DBCP	DIBROMOCHLOROPROPANE
DBHC	DELTA-BENZENEHEXACHLORIDE / DELTA-HEXACHLOROCYCLOHEXANE
DBRCLM	DIBROMOCHLOROMETHANE
DBTSPY	4,5-DIMETHYL-2,6-BIS(TRIMETHYLSILOXY) PYRIMIDINE
DCBPH	DICHLOROBENZOPHENONE
DCHP	DICYCLOHEXYL PHTHALATE
DCMBF	5,7-DICHLORO-2-METHYL BENZOFURAN
DCPD	DICYCLOPENTADIENE
DDVP	VAPONA
DEA	DIETHYL AMINE
DEDMP	DIETHYLDIMETHYL DIPHOSPHONATE
DEETH	DIETHYL ETHER
DEP	DIETHYL PHTHALATE
DHBZPY	3,4-DIHYDRO-2H-1-BENZOPYRAN
DIACAL	DIACETONE ALCOHOL / 4-HYDROXY-4-METHYL-2-PENTANONE
DIADS	BIS(DIISOPROPYLAMINOETHYL) DISULFIDE
DIAEL	DIISOPROPYL AMINOETHANOL
DIAEP	S-DIISOPROPYLAMINOETHYLMETHYL PHOSPHONOTHIOATE
DIAET	DIISOPROPYL AMINOETHANETHIOL
DIAS	BIS(DIISOPROPYLAMINOETHYL) SULFIDE
DIAZ	DIAZINON
DIBP	DIISOBUTYL PHTHALATE
DICLP	DICHLOROPHENOLS
DIDDP	DIISOPROPYLDIMETHYL DIPHOSPHONATE
DIMP	DIISOPROPYLMETHYL PHOSPHONATE
DIPUR	DIISOPROPYL UREA
DITH	DITHIANE
DLDRN	DIELDRIN
DL2HPG	DL-2-(3-HYDROXYPHENYL) GLYCINE
DM	ADAMSITE
DMA	DIMETHYL ANILINE (OBSOLETE; USE NNDMA)
DMCAR	DIMETHYL DITHIOCARBONATE
DMCPDE	1,2-DIMETHYL CYCLOPENTADIENE

DMETH	DIMETHYL ETHER
DMMP	DIMETHYLMETHYL PHOSPHATE
DMP	DIMETHYL PHTHALATE
DMPCHE	3-(2,2-DIMETHYLPROPOXY) CYCLOHEXENE
DMPTHF	2,2-DIMETHYL-5-(1-METHYLPROPYL) TETRAHYDROFURAN
DM1ACH	2,2-DIMETHYL-1-ACETYL CYCLOHEXANE
DNBEE	1,1-DI-N-BUTYL ETHYLENE / 1,1-DI-N-BUTYL ETHENE
DNBP	DI-N-BUTYL PHTHALATE
DNOP	DI-N-OCTYL PHTHALATE
DNPP	DI-N-PENTYL PHTHALATE
DNTISO	DINITROTOLUENE ISOMER
DO	DISSOLVED OXYGEN
DOAD	DIOCTYL ADIPATE
DOAZ	DIOCTYL AZELATE
DOETH	DIOCTYL ETHER
DOPAM	4-(2-AMINOETHYL) PYROCATECHOL / DOPAMINE
DPA	DIPHENYL AMINE
DPETH	DIPHENYL ETHER
DPHNY	DIPHENYL
DPNTLL	D-(-)-PANTOLYL LACTONE
DPSO	DIPHENYL SULFOXIDE
DS	DISULFIDE
DTB4C	2,6-DI-TERT-BUTYL-4-CRESOL
DTCHBO	1.ALPHA.(E),4.ALPHA.-1-(1,4-DIHYDROXY-2,6,6-TRIMETHYL-2-CYCLOHEXEN-1-YL)-2-BUTEN-1-ONE
DURS	DURSBAN
DYSCAN	GC-MS DYE SCAN
EBCPGL	ETHYL-2,2-BIS(4-CHLOROPHENYL) GLYCOLATE
ED	DICHLOROETHYL ARSINE
EMP	ETHYLMETHYL PHOSPHONATE
EMPA	ETHYLMETHYL PHOSPHONIC ACID
ENDRN	ENDRIN
ENHETH	ETHYL-N-HEXYL ETHER
ESFSO4	ENDOSULFAN SULFATE
ETC6H5	ETHYL BENZENE
ETOH	ETHANOL
F	FLUORIDE
FABPEE	FORMIC ACID, BETA-PHENYLETHYL ESTER
FANT	FLUORANTHENE
FARN	FARNESOL
FATAL	FATTY ALCOHOL
FE	IRON
FLRENE	FLUORENE
FREON	FREON / DICHLOROFLUOROMETHANE
F10BP	DECAFLUOROBIPHENYL
GA	TABUN / ETHYL-N,N-DIMETHYL PHOSPHORAMIDOCYANIDATE
GAMAG	GAMMA GROSS
GB	SARIN / ISOPROPYLMETHYL PHOSPHONOFLUORIDATE
GBHC	GAMMA-BENZENEHEXACHLORIDE / GAMMA-HEXACHLOROCYCLOHEXANE
GD	SOMAN / PINACOLYLMETHYL PHOSPHONOFLUORIDATE
GRNDY	GREEN DYE
H	LEVINSTEIN MUSTARD
HARD	TOTAL HARDNESS
HCBD	HEXACHLOROBUTADIENE

HCNB	HEXACHLORONORBORNADIENE
HCO3	BICARBONATE
HD	DISTILLED MUSTARD / BIS(2-CHLOROETHYL) SULFIDE
HEXANE	HEXANE
HG	MERCURY
HGEXT	MERCURY EXTRACTABLE
HGTOT	MERCURY TOTAL
HMX	CYCLOTETRAMETHYLENETETRANITRAMINE
HN	NITROGEN MUSTARD
HPCL	HEPTACHLOR
HPCLE	HEPTACHLOR EPOXIDE
HPO4	HYDROLYZABLE PHOSPHATE
HWX013	HALOWAX 1013
HWX099	HALOWAX 1099
HXADBE	HEXANEDIOIC ACID, DIBUTYL ESTER / DIBUTYL ADIPATE
HXADOE	HEXANEDIOIC ACID, DIOCTYL ESTER
HXCOS	HEXACOSANE
HXHMAZ	4,5,6,7,8,8A-HEXAHYDRO-8A-METHYL-2(1H)-AZULENONE
HYNB	7-HYDROXY NORBORNADIENE
H2S	HYDROGEN SULFIDE
ICDPYR	INDENO(1,2,3-C,D)PYRENE
IMP	ISOPROPYLMETHYL PHOSPHONATE
IMPA	ISOPROPYLMETHYL PHOSPHONIC ACID
INDAN	1-HYDROXY-2,3-METHYLENE INDAN [M.W.146]
ISODR	ISODRIN
ISOPBZ	ISOPROPYL BENZENE / CUMENE
ISOPHR	ISOPHORONE
K	POTASSIUM
KEND	KETO-ENDRIN
K40	POTASSIUM 40
L	LEWISITE
LACYBB	LACTIC ACID CYCLIC BUTANEBORONATE
LAURIC	LAURIC ACID
LIN	LINDANE
LIPID	% LIPIDS
LO	LEWISITE OXIDE
MALO	MALONONITRILE
MBADOE	3-METHYL BUTANOIC ACID, 3,7-DIMETHYL-2,4,6-OCTATRIENYL ESTER
MBAS	FOAMING AGENTS / METHYALYNE BLUE ACTIVE SUBSTANCE
MBOH	ALPHA-METHYLBENZYL ALCOHOL
MBZA	ALPHA-METHYLBENZYL ACETOACETATE
MBZCL	ALPHA-METHYLBENZYL-2-CHLOROACETOACETATE
MDCL	2-METHYL UNDECANAL / 2-METHYL HENDECANAL
MEBPIP	1,1'-METHYLENEBIS-PIPERIDINE
MECC6	METHYL CYCLOHEXANE
MECYBU	METHYL CYCLOBUTANE
MECYPE	METHYL CYCLOPENTANE
MEC5D8	TOLUENE-D8
MEC6H5	TOLUENE
MEHG	METHYL MERCURY
MEK	METHYLETHYL KETONE
MEOH	METHANOL
MEPOH	2-METHYL PENTANOL
MESTOX	MESITYL OXIDE / 4-METHYL-3-PENTEN-2-ONE

METLAP	METHYL NAPHTHALENE
MEXCLR	METHOXYCHLOR
ME2HPL	METHYL-2-HEPTANOL
MG	MAGNESIUM
MIBK	METHYLISOBUTYL KETONE
MIPK	METHYLISOPROPYL KETONE
MIREX	MIREX
MLTHN	MALATHION
MN	MANGANESE
MO	MOLYBDENUM
MOIS	MOISTURE
MONOC	MONOCHLOR
MP	METHYL PHENOL
MPA	METHYL PHOSPHONIC ACID
MPDDD	2-(META-CHLOROPHENYL)-2-(PARA-CHLOROPHENYL)-1,1-DICHLOROETHANE
MSSCAN	GC-MS ORGANIC SCAN
MTRZL	METRAZOL / CARDIAZOLE
NA	SODIUM
NAP	NAPHTHALENE
NAPD8	NAPHTHALENE-D8
NA22	SODIUM 22
NB	NITROBENZENE
NBD5	NITROBENZENE-D5
NC	NITROCELLULOSE
NCLN	NORTRICYCLANOL
NCPPPA	N-(4-CHLOROPHENYL)-3-PHENYL-2-PROPENAMIDE
NC1	NITROCELLULOSE 12% N
NC2	NITROCELLULOSE 13.4% N
NDHXA	N-NITRODIHEXYL AMINE
NDIOX	NITROGEN DIOXIDE
NDNPA	NITROSODI-N-PROPYL AMINE
NECHXA	N-ETHYLCYCLOHEXYL AMINE
NE2PEA	N-ETHYL-2-PROPENAMIDE
NG	NITROGLYCERINE
NH3	AMMONIA
NH3N2	AMMONIA NITROGEN
NI	NICKEL
NIT	NITRITE,NITRATE-NON SPECIFIC
NMCANE	N-METHYL CARBAMIC ACID, 1-NAPHTHYL ESTER
NNDMA	N,N-DIMETHYL ANILINE
NNDPA	N-NITROSODIPHENYL AMINE
NNPIPA	N-NITROSOPENTYLISOPENTYL AMINE
NN4HPL	N-NITROSO-4-HYDROXY PROLINE
NO2	NITRITE
NO3	NITRATE
NUDRN	NUDRIN
N2KJEL	NITROGEN BY KJELDAHL METHOD
ODAPDM	OCTADECANOIC ACID, (2-PHENYL-1,3-DIOXOLAN-4-YL)-METHYL ESTER
ODECA	OCTADECANOIC ACID / STEARIC ACID
OEMP	O-ETHYLMETHYL PHOSPHONATE
OILGR	OIL & GREASE
OPDDD	2-(ORTHO-CHLOROPHENYL)-2-(PARA-CHLOROPHENYL)-1,1-DICHLOROETHANE
OPDDE	2-(ORTHO-CHLOROPHENYL)-2-(PARA-CHLOROPHENYL)-1,1-DICHLOROETHENE
OPDDT	2-(ORTHO-CHLOROPHENYL)-2-(PARA-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE

[illegible]	ORGANOPHOSPHATES
[illegible]	1,4-OXATHIANE
OXCN	OXACYCLONONANE
OZONE	OZONE
[illegible]TIC	PARTICULATE MATTER
PA2HDE	PROPANOIC ACID, 2-HYDROXYDECYL ESTER
PA2MBE	PENTANOIC ACID, 2-METHYLBUTYL ESTER
PA231	PROTACTINIUM 231
[illegible]34	PROTACTINIUM 234
PB	LEAD
[illegible]Y	LEAD STYPHNATE
PB214	LEAD 214
[illegible]	PCB 1016
PCB221	PCB 1221
PCB232	PCB 1232
PCB242	PCB 1242
PCB248	PCB 1248
PCB254	PCB 1254
PCB260	PCB 1260
PCB262	PCB 1262
PCP	PENTACHLOROPHENOL
[illegible]	DICHLOROPHENYL ARSINE
PDMSLX	POLYDIMETHYL SILOXANE / DIMETHYLPOLY SILOXANE
PEGE	POLYETHYLENE GLYCOL ETHERS
[illegible]	N-PENTAMIDE
PENTAN	PENTANE
[illegible]	PENTAERYTHRITOL TETRANITRATE
PFP	PENTAFLUOROPHENOL
[illegible]	PH
[illegible]	PHENANTHRENE
[illegible]	PHOSDRIN
PHENAA	PHENYL ACETIC ACID
PHEND6	PHENOL-D6
PHENOL	PHENOL
PHTHL	PHTHALATES
[illegible]CP	1,2,3,4,5-PENTAHYDROXYCYCLOPENTANE
PIPER	PIPERIDINE
POX	PURGEABLE ORGANIC HALOGEN
PO4	PHOSPHATE
PO4OPT	ORTHOPHOSPHATE
PPDDD	2,2-BIS(PARA-CHLOROPHENYL)-1,1-DICHLOROETHANE
PPDDE	2,2-BIS(PARA-CHLOROPHENYL)-1,1-DICHLOROETHENE
PPDDT	2,2-BIS(PARA-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE
PPTDE	2,2-BIS(PARA-CHLOROPHENYL)-2-PHENYL-1,1-DICHLOROETHENE
PRTHN	PARATHION
PYR	PYRENE
P4	PHOSPHORUS
RA223	RADIUM 223
RA226	RADIUM 226
RA228	RADIUM 228
RDX	CYCLONITE / HEXAHYDRO-1,3,5-TRINITRO-1,3,4-TRIAZINE
REDDY	RED DYE
RESACI	RESIN ACIDS
RN219	RADON 219

RN220	RADON 220
RN222	RADON 222
S	SULFUR
SB	ANTIMONY
SE	SELENIUM
SIL	SILICONE
SILVEX	SILVEX
SN	TIN
SO3	SULFITE
SO4	SULFATE
SPIRO	(1',5 TRANS)-7-CHLORO-6-HYDROXY-2',4-DIMETHOXY-6'-METHYL-SPIRO(BENZOFURAN-2(3H),1'-(2) CYCLOHEXENE)-3,4'-DIONE
SQUAL	SQUALENE
SR	STRONTIUM
SS	SETTLEABLE SOLIDS
STIGMA	STIGMASTENAL
STYPH	STYPHNATE ION
STYPHA	STYPHNIC ACID
STYR	STYRENE
SULFID	SULFIDE
S2CL2	SULFUR MONOCHLORIDE
TBA	TRIBUTYL AMINE
TBASDE	THIOBUTYRIC ACID, S-DECYL ESTER
TBP	TRIBUTYL PHOSPHATE
TCB	TETRACHLOROBENZENES
TCB1	1,2,4,5-TETRACHLOROBENZENE
TCB2	1,2,3,4-TETRACHLOROBENZENE
TCB3	1,2,3,5-TETRACHLOROBENZENE
TCHDCS	TRANS-1,2-CYCLOHEXANDIOL, CYCLIC SULFITE
TCLEA	1,1,2,2-TETRACHLOROETHANE
TCLEE	TETRACHLOROETHYLENE / TETRACHLOROETHENE
TCLTFE	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE
TCOS	TETRACOSANE
TCSAME	15-TETRACOSENOIC ACID, METHYL ESTER
TCST	TRICHLOROSTYRENE
TDGCL	THIODIGLYCOL
TDMHSX	TETRADECAMETHYL HEXASILOXANE
TDODTL	TERT-DODECANETHIOL
TDS	TOTAL DISSOLVED SOLIDS
TEGLME	TRIETHYLENE GLYCOL, METHYL ETHER
TEMP	TEMPERATURE
TEPO4	TRIETHYL PHOSPHATE
TETPT	TETRACHLOROCYCLOPENTENE
TETR	TETRAZENE
TETRYL	NITRAMINE / N-METHYL-N,2,4,6-TETRANITROANILINE
TFAAPE	TRIFLUOROACETIC ACID, 1,5-PENTANEDIYL ESTER
TFDCLE	1,1,2-TRIFLUORO-1,2-DICHLOROETHANE
THF	TETRAHYDROFURAN
THNAT	THORIUM NATURAL
THP2ML	TETRAHYDROPYRANYL-2-METHANOL
TH227	THORIUM 227
TH228	THORIUM 228
TH230	THORIUM 230
TH232	THORIUM 232

TL	THALLIUM
TMHPDO	3,3,6-TRIMETHYL-1,5-HEPTADIEN-4-ONE
TMHXL	3,5,5-TRIMETHYL-1-HEXANOL
TMODEO	2,2,7,7-TETRAMETHYL-4,5-OCTADIEN-3-ONE
TMPO3	TRIMETHYL PHOSPHITE
TMPO4	TRIMETHYL PHOSPHATE
TMUR	TETRAMETHYL UREA
TM3PL	2,3,4-TRIMETHYL-3-PENTANOL
TNTISO	TRINITROTOLUENE ISOMER
TOC	TOTAL ORGANIC CARBON
TOTDDT	TOTAL VALUE OF ALL DDT, DDE, DDD ISOMERS
TOTHG2	TOTAL MERCURY
TOTPCB	TOTAL PCB
TPH	THIOPHENE
TPO4	TOTAL PHOSPHATES
TRCLE	TRICHLOROETHYLENE / TRICHLOROETHENE
TRIBZ	TRICHLOROBENZENES (ALL ISOMERS)
TRIMBZ	TRIMETHYL BENZENE
TRIPT	TRICHLOROCYCLOPENTENE
TRITIU	TRITIUM
TRMTDE	2,3,4-TRIMETHYL-4-TETRADECENE
TRXMET	TRIHALOMETHANES
TS	TOTAL SULFUR
TSS	TOTAL SUSPENDED SOLIDS
TU	TOTAL URANIUM
TVS	TOTAL VOLATILE SOLIDS
TX	WHEAT RUST
TXPHEN	TOXAPHENE
T1B2BC	TRANS-1-BROMO-2-BUTYL CYCLOPROPANE
T12DCE	TRANS-1,2-DICHLOROETHENE / TRANS-1,2-DICHLOROETHYLENE
T13DCP	TRANS-1,3-DICHLOROPROPENE
T2DEC	TRANS-2-DECENE
UDEP	URANIUM DEPLETED
UDMH	UNSYMMETRICAL DIMETHYL HYDRAZINE
UNAT	URANIUM NATURAL
UNKXXX	UNKNOWN COMPOUND 001 THRU 999. NOTE: 001-999 FULL FIELD AS SHOWN
U234	URANIUM 234
U235	URANIUM 235
U238	URANIUM 238
V	VANADIUM
VARHY	VARIOUS HYDROCARBONS WITH INCREASING M.W.
VFA	VINYL FORMATE
VM	O-ETHYL-S-(2-DIETHYLAMINOETHYL)-METHYL PHOSPHONOTHIOLATE
VOL	VOLATILES
VX	O-ETHYL-S-(2-DIISOPROPYLAMINOETHYL)-METHYL PHOSPHONOTHIOLATE
WP	WHITE PHOSPHORUS
XCOMP	REMAINING EXPLOSIVE COMPOUNDS
XPLGAS	EXPLOSIVE GAS
XPLOSV	EXPLOSIVE SPRAY
XYLEN	XYLENES
YELDY	YELLOW DYE
ZN	ZINC
ZN65	ZINC 65
ZR	ZIRCONIUM

1A3MPZ	1-ACETYL-3-METHYL-5-PYRAZOLONE
1BY4HB	1-BENZYL-4-HYDROXYBENZIMIDAZOLE
1CDMPZ	1-CARBAMOYL-3,5-DIMETHYL-2-PYRAZOLINE
1DODCL	1-DODECANOL
1EHB	1-ETHYLHEXYL BENZENE
1HXE	1-HEXENE
1HX3OL	1-HEXEN-3-OL
1MEIND	1-METHYL INDAN
1NHP	1-NITROHEPTANE
1N2ONE	1-NITRO-2-OCTANONE
1TBCHA	1-T-BUTYLCYCLOHEXANECARBOXYLIC ACID
11DCE	1,1-DICHLOROETHYLENE / 1,1-DICHLOROETHENE
11DCLE	1,1-DICHLOROETHANE
111TCE	1,1,1-TRICHLOROETHANE
112TCE	1,1,2-TRICHLOROETHANE
12DCLB	1,2-DICHLOROBENZENE
12DCLE	1,2-DICHLOROETHANE
12DCLP	1,2-DICHLOROPROPANE
12DPH	1,2-DIPHENYL HYDRAZINE
12DMB	1,2-DIMETHYL BENZENE / O-XYLENE
12EPEB	1,2-EPOXYETHYL BENZENE / STYRENE OXIDE
124TCB	1,2,4-TRICHLOROBENZENE
13DCLB	1,3-DICHLOROBENZENE
13DEB	1,3-DIETHYL BENZENE
13DFB	1,3-DIFLUOROBENZENE
13DBM	1,3-DIMETHYL BENZENE / M-XYLENE
13DNB	1,3-DINITROBENZENE
13TDAM	13-TETRADECYNOIC ACID, METHYL ESTER
135TNB	1,3,5-TRINITROBENZENE
14DCBU	1,4-DICHLOROBUTANE
14DCLB	1,4-DICHLOROBENZENE
14DMNP	1,4-DIHYDRO-1,4-METHANONAPHTHALENE
14DNB	1,4-DINITROBENZENE
14D2EB	1,4-DIMETHYL-2-ETHYL BENZENE
18DNAP	1,8-DIMETHYL NAPHTHALENE
18O18D	1,2,3,4,4A,5,8,8A-OCTAHYDRO-1,4,5,8-DIMETHANOLNAPHTHALEN-2-OL
2A46DA	2-AMINO-4,6-DINITROANILINE
2A46DT	2-AMINO-4,6-DINITROTOLUENE
2BEETO	2-(2-N-BUTOXYETHOXY) ETHANOL
2BEMDE	2,2-BIS(ETHYLMERCAPTO)-DIETHYL ETHER
2BNMNM	2-BUTYL-N-METHYL NORLEUCINE, METHYL ESTER
2BRHXA	2-BROMOHEXANOIC ACID
2BUXEL	2-BUTOXYETHANOL
2B1CP	2-BROMO-1-CHLOROPROPANE
2B1OOL	2-BUTYL-1-OCTANOL
2CBMN	O-CHLOROBENZYLIDINEMALONONITRILE
2CECHO	2-(2-CYANOETHYL) CYCLOHEXANONE
2CHAEE	2-CYCLOPENTENE-1-HENDECANOIC ACID, ETHYL ESTER
2CHE1O	2-CYCLOHEXEN-1-ONE
2CLP	2-CHLOROPHENOL
2CMCHO	2-(CYANOMETHYL) CYCLOHEXANONE
2CNAP	2-CHLORONAPHTHALENE
2DMPEN	2,2-DIMETHYL PENTANE
2E2HPD	2-ETHYL-2-HYDROXYMETHYL-1,3-PROPANEDIOL

2FBP	2-FLUOROBIPHENYL
2FNAP	2-FLUORONAPHTHALENE
2FP	2-FLUOROPHENOL
2HNDOL	2-HENDECANOL / 2-UNDECANOL
2MBZA	2-METHYLBENZYL ALCOHOL
2MCPNE	2-METHYL CYCLOPENTANONE
2MEPEN	2-METHYL PENTANE
2MP	2-METHYL PHENOL / 2-CRESOL
2MTHPM	2-METHYLTHIO-4-HYDROXYPYRIMIDINE
2M1DDL	2-METHYL-1-DODECANOL
2M1PNE	2-METHYL-1-PENTENE
2M2BDA	2-METHYL-2-BUTENEDIAMIDE
2M2H3B	2-METHYL-2-HYDROXY-3-BUTYNE
2M24P	2-METHYL-2,4-PENTANEDIOL
2NBZLZ	2-NITROBENZALAZINE
2NP	2-NITROPHENOL
2NT	2-NITROTOLUENE
2N3C	3-METHYL-2-NITROPHENOL / 2-NITRO-M-CRESOL
2TCLEA	1,1,1,2-TETRACHLOROETHANE
225TCB	2,2',5-TRICHLOROBIPHENYL
2255CB	2,2',5,5'-TETRACHLOROBIPHENYL
23DCLP	2,3-DICHLOROPHENOL
23D2HL	2,3-DIMETHYL-2-HEXANOL
2345CB	2,3,4,5-TETRACHLOROBIPHENYL
2346CP	2,3,4,6-TETRACHLOROPHENOL
2356CP	2,3,5,6-TETRACHLOROPHENOL
24D	2,4-DICHLOROPHENOXYACETIC ACID
24DCB	2,4'-DICHLOROBIPHENYL
24DCLP	2,4-DICHLOROPHENOL
24DMPN	2,4-DIMETHYL PHENOL
24DNP	2,4-DINITROPHENOL
24DNT	2,4-DINITROTOLUENE
245PCB	2,2'4,5,5'-PENTACHLOROBIPHENYL
245TCP	2,4,5-TRICHLOROPHENOL
246TCA	2,4,6-TRICHLOROANILINE
246TCP	2,4,6-TRICHLOROPHENOL
246TNP	2,4,6-TRINITROPHENOL / PICRIC ACID
246TNR	2,4,6-TRINITRORESORCINOL / STYPHNIC ACID
246TNT	2,4,6-TRINITROTOLUENE
25C14D	2,5-CYCLOHEXADIEN-1,4-DIONE
25DCLP	2,5-DICHLOROPHENOL
25HXCB	2,2',3,4,5,5'-HEXACHLOROBIPHENYL
26DBMP	2,6-DI-T-BUTYL-4-METHYL PHENOL
26DCLP	2,6-DICHLOROPHENOL
26DMST	2,6DIMETHYL STYRENE
26DNA	2,6-DINITROANILINE
26DNT	2,6-DINITROTOLUENE
26HPCB	2,2',3,4,4',5,6-HEXACHLOROBIPHENYL
3BPETH	3-BUTENYLPENTYL ETHER
3CLP	3-CHLOROPHENOL
3CMCH	3-(CHLOROMETHYL) CYCLOHEXANE
3EHXDE	3-ETHYL-1,4-HEXADIENE
3HDMPL	3-(HYDROXYMETHYL)-4,4-DIMETHYL PENTANAL
3HDMPT	3-HYDROXY-2,7-DIMETHYL-4(3H)-PTERIDINONE

3HXE2O	3-HEXEN-2-ONE
3MP	3-METHYL PHENOL / 3-CRESOL
3MXIMZ	3-METHOXYIMIDAZOLE
3M1PL	3-METHYL-1-PENTANOL
3M2CHO	3-METHYL-2-CYCLOHEXEN-1-ONE
3M2C1O	3-METHOXY-2-CYCLOPENTEN-1-ONE
3M2HXL	3-METHYL-2-HEXANOL
3NT	3-NITROTOLUENE
3OCTOL	3-OCTANOL
3OPPAE	3-OXO-3-PHENYL PROPANOIC ACID, ETHYL ESTER
34DCLP	3,4-DICHLOROPHENOL
345T1H	3,4,5-TRIMETHYL-1-HEXENE
35DNA	3,5-DINITROANILINE
35DNT	3,5-DINITROTOLUENE
36DF9O	3,6-DICHLOROFLUOREN-9-ONE
4A35DT	4-AMINO-3,5-DINITROTOLUENE
4BRPPE	4-BROMOPHENYLPHENYL ETHER
4CLPPE	4-CHLOROPHENYLPHENYL ETHER
4CL2C	2-METHYL-4-CHLOROPHENOL / 4-CHLORO-2-CRESOL
4CL3C	3-METHYL-4-CHLOROPHENOL / 4-CHLORO-M-CRESOL / 4-CHLORO-3-CRESOL
4DM2PL	4,4-DIMETHYL-2-PENTANOL
4FANIL	4-FLUOROANILINE
4FT	4-FLUOROTOLUENE
4HAZOB	4-HYDROXYAZOBENZENE
4HYBA	4-HYDROXYBENZALDEHYDE
4IOMQU	4-IODOMETHYL QUINULCIDINE
4MP	4-METHYL PHENOL / 4-CRESOL
4MXCHL	4-METHOXYCYCLOHEXANOL
4MXP	4-METHOXYPHENOL
4M2PPL	4-METHYL-2-PROPYL-1-PENTANOL
4NP	4-NITROPHENOL
4TOP	4-T-OCTYL PHENOL
44DFBZ	4,4-DIFLUOROBENZOPHENONE
44DMPE	4,4-DIMETHYL-2-PENTENE
46DN2C	2-METHYL-4,6-DINITROPHENOL / 4,6-DINITRO-2-CRESOL
48DMHD	4,8-DIMETHYL HENDECANE
5CL2C	5-CHLORO-O-CRESOL / 2-METHYL-5-CHLOROPHENOL
5M5HAL	5-METHYL-5-HYDROXYHEXANOIC ACID LACTONE
5N2OL	5-NORBOREN-2-OL
6CL3C	3-METHYL-6-CHLOROPHENOL / 6-CHLORO-3-CRESOL
6E6MFV	6-ETHYL-6-METHYL FULVENE
6MEPUR	6-METHYL PURINE

APPENDIX B

AQUIFER TESTING

KEY TO APPENDIX B: AQUIFER TESTING

The diagram pictured on the aquifer testing data sheets does not depict the actual procedure used, as described in Chapter 3. A more accurate representation appears in Figure B-1. Definition of terms used on aquifer testing data sheets and Figure B-1 are as follows:

H_o = height of total water level rise at time zero

H_t = height of water level at measurement $time_t$

t = time in minutes

L = total screen length

SWL = static water level

CALCULATIONS FOR CAAP AQUIFER TESTING

Well No.	R_C^2 (cm)	t (sec)	L_S (cm)	T (cm^2/sec)	K (cm/sec)	S* (dimensionless)
G3	25.8	2.70	335	9.55	2.9×10^{-2}	10^{-10}
G7	25.8	1.02	403	25.29	6.3×10^{-2}	10^{-8}
G16	25.8	1.26	269	20.48	7.6×10^{-2}	10^{-8}
G17	25.8	1.32	358	19.54	5.5×10^{-2}	10^{-3}
G22	25.8	0.96	457	26.88	5.9×10^{-2}	10^{-9}
G23	25.8	0.66	447	39.09	8.7×10^{-2}	10^{-10}
G24	25.8	2.88	403	8.96	2.2×10^{-2}	10^{-10}
G27	25.8	0.72	439	35.83	8.2×10^{-2}	10^{-7}
G30	25.8	0.48	401	53.75	1.3×10^{-2}	10^{-5}
G33	25.8	0.78	340	33.08	9.7×10^{-2}	10^{-9}

R_C^2 = radius of well casing - squared

t = time in seconds after instantaneous rise, where $\frac{Tt}{R_C^2} = 1$

L_S = saturated screen length

T = transmissivity = $\frac{R_C^2}{t}$

S = storage coefficient = determined from Type Curves

$\frac{Tt}{R_C^2} \alpha W(u)$ = a well function used in Type Curves

*Values found using this method are generally assumed to be corresponding to a confined aquifer, with wells fully penetrating. Correlating data, though, shows these values to be fairly accurate.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 3

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

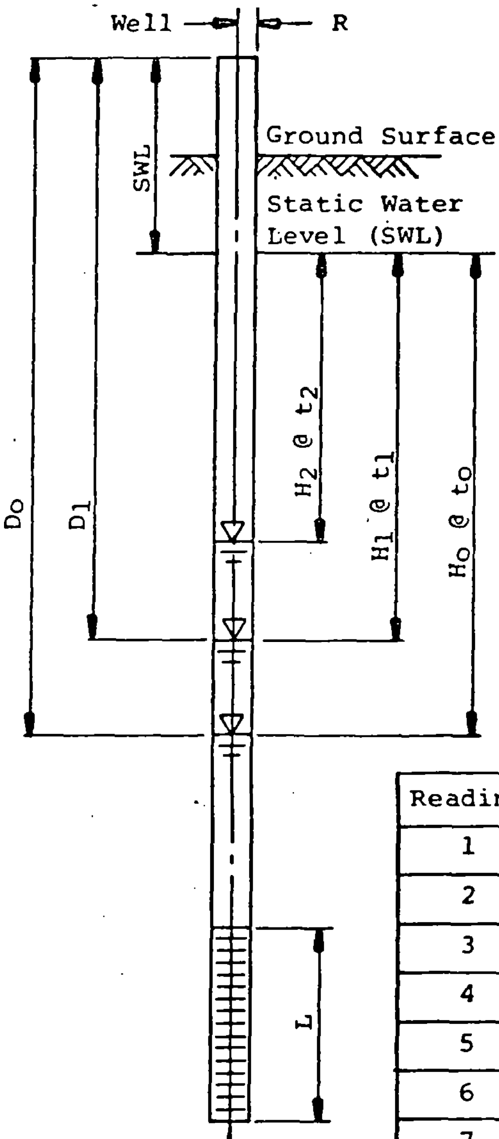
8) Static Water Level 17.58 (ft.)
(depth to water)

9) Total Well Depth 29.50 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 11.0' = 335cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	H_t inches	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.233	D_1	H_1 15.025	0.312
3	t_2 0.450	D_2	H_2 13.625	0.283
4	t_3 0.533	D_3	H_3 7.875	0.164
5	t_4 0.700	D_4	H_4 5.875	0.122
6	t_5 0.800	D_5	H_5 4	0.083
7	t_6 0.883	D_6	H_6 2	0.042
8	t_7 3.483	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 3

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

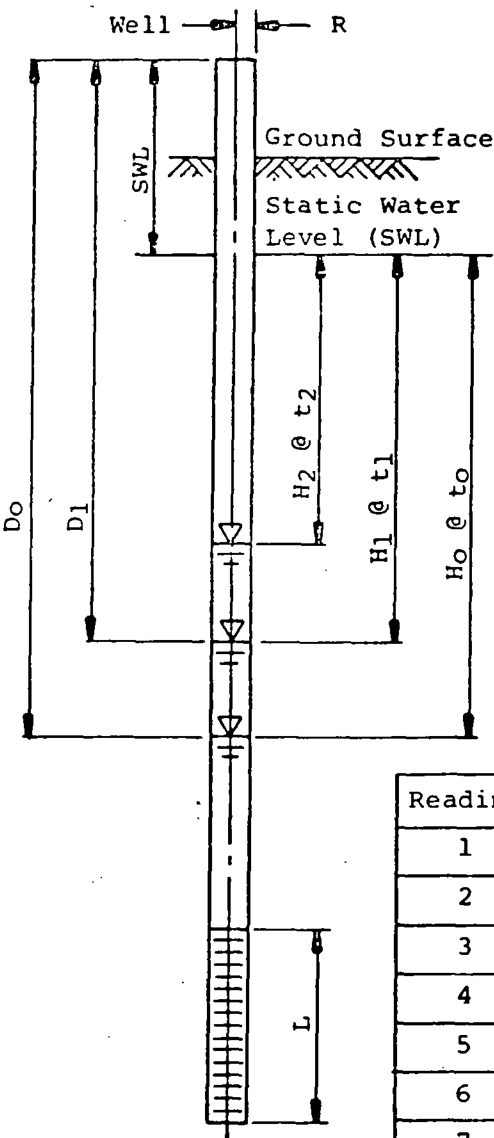
8) Static Water Level 17.58 (ft.)
(depth to water)

9) Total Well Depth 29.50 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length 11.0' = 335 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	H_t — inches	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 13.625	0.283
3	t_2 0.433	D_2	H_2 7.875	0.164
4	t_3 0.600	D_3	H_3 5.875	0.122
5	t_4 0.850	D_4	H_4 4	0.083
6	t_5 1.300	D_5	H_5 2	0.042
7	t_6 3.067	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel OTC/SAH

5) Well or Boring No. 3

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

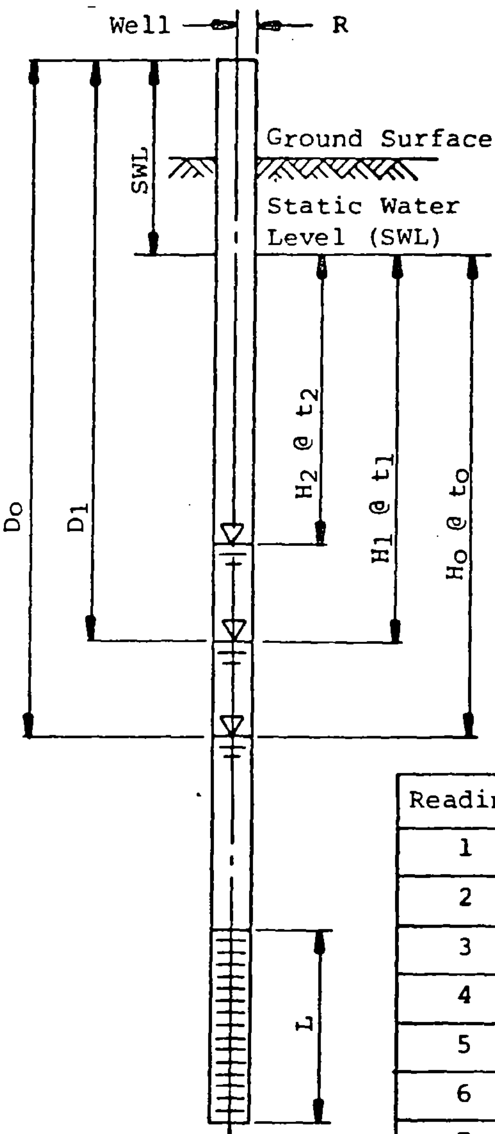
8) Static Water Level 17.58 (ft.)
(depth to water)

9) Total Well Depth 29.50 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

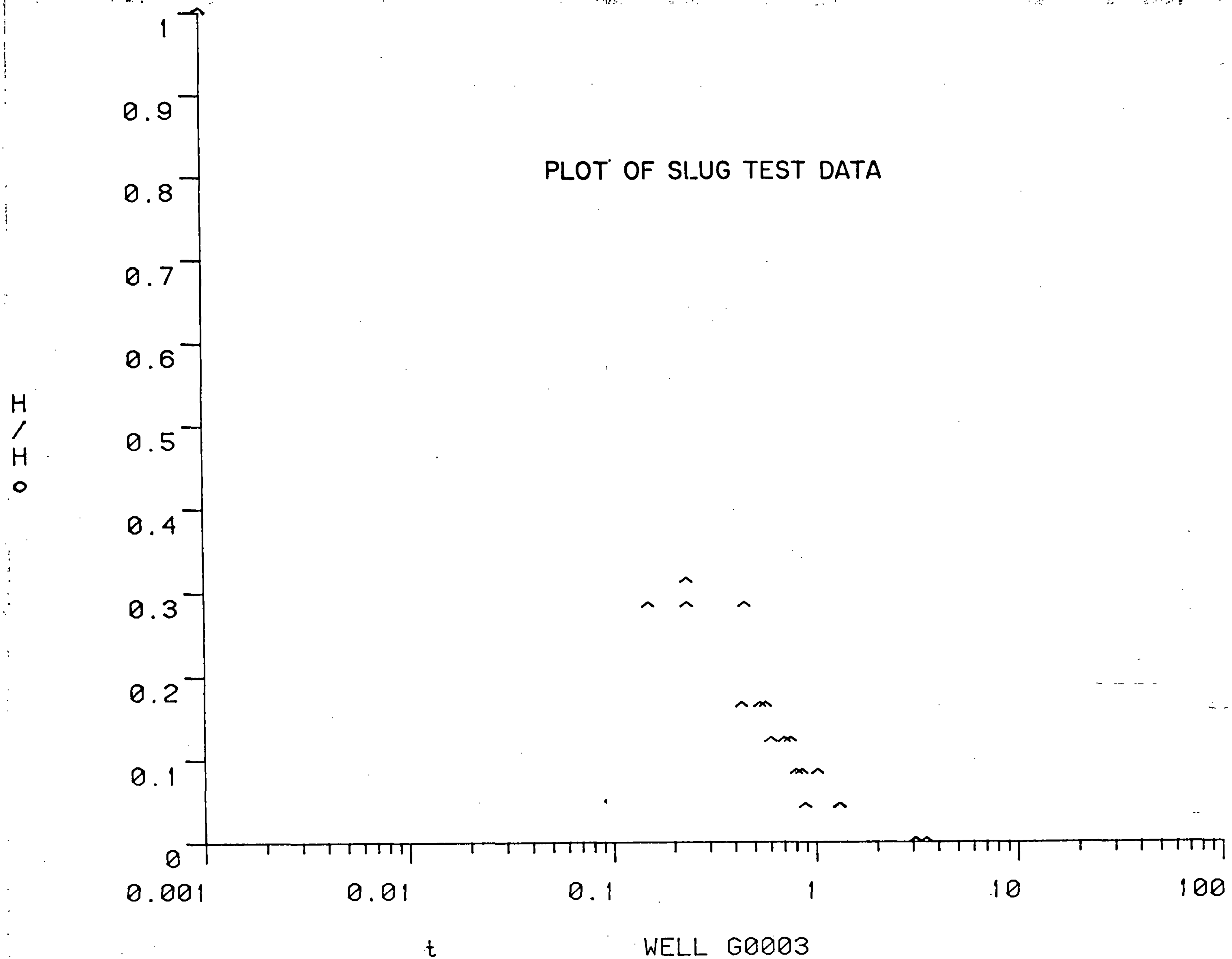
11) saturated screen length = 11.0' = 335 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	H_t inches	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.233	D_1	H_1 13.625	0.283
3	t_2 0.567	D_2	H_2 7.875	0.164
4	t_3 0.750	D_3	H_3 5.875	0.122
5	t_4 1.017	D_4	H_4 4	0.083
6	t_5 1.317	D_5	H_5 2	0.042
7	t_6 3.100	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
H/Ho
0.001
0.01
0.1
1
10
100
t
WELL G0003

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 7

6) R=Radius of Well 4.0 (in.)

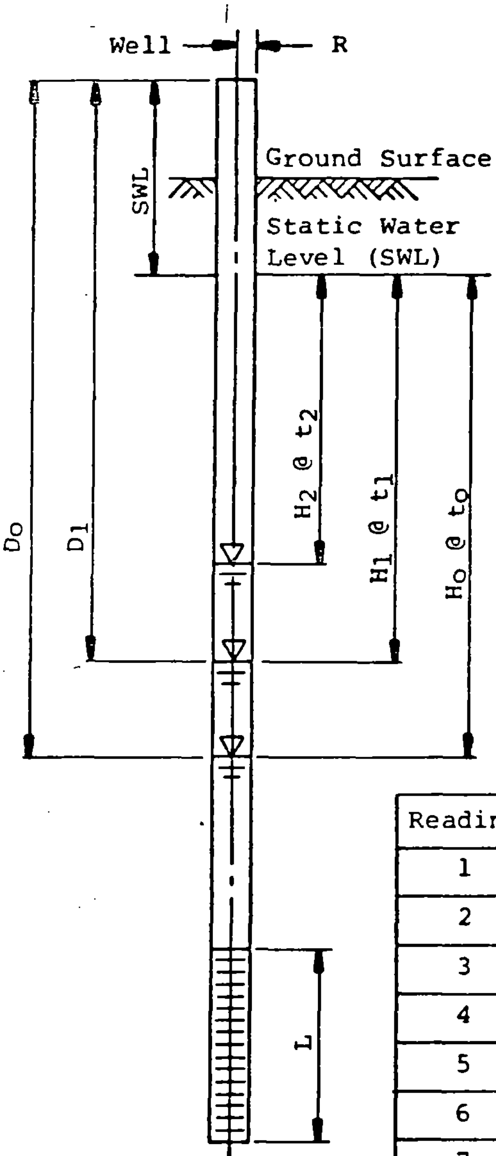
7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

8) Static Water Level 14.29 (ft.)
(depth to water)

9) Total Well Depth 29.83 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #1

11) saturated screen length 13.22' = 403cm



Reading*	Time (Start)	Depth to Water (After Baildown) D_t	H_t**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 10	0.208
3	t_2 0.183	D_2	H_2 8	0.166
4	t_3 0.217	D_3	H_3 6	0.125
5	t_4 0.283	D_4	H_4 4	0.083
6	t_5 0.400	D_5	H_5 2	0.042
7	t_6 0.633	D_6	H_6 0.8	0.017
8	t_7 1.133	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 7

6) R=Radius of Well 4.0 (in.)

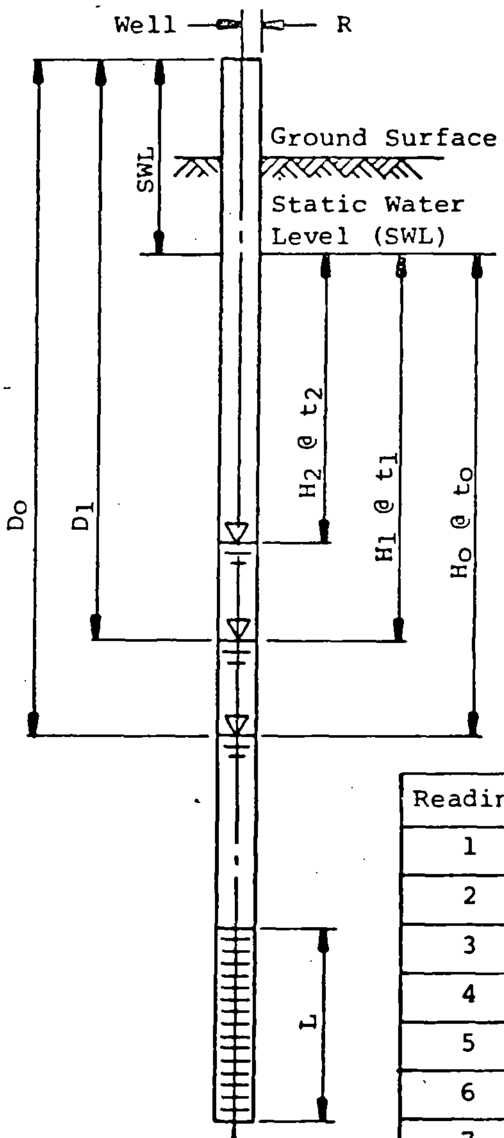
7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

8) Static Water Level 14.29 (ft.)
(depth to water)

9) Total Well Depth 29.83 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #2

11) saturated screen length 13.22' = 403 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	H_t **	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.167	D_1	H_1 8	0.166
3	t_2 0.217	D_2	H_2 6	0.125
4	t_3 0.267	D_3	H_3 4	0.083
5	t_4 0.333	D_4	H_4 2	0.042
6	t_5 0.517	D_5	H_5 0.8	0.017
7	t_6 0.717	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

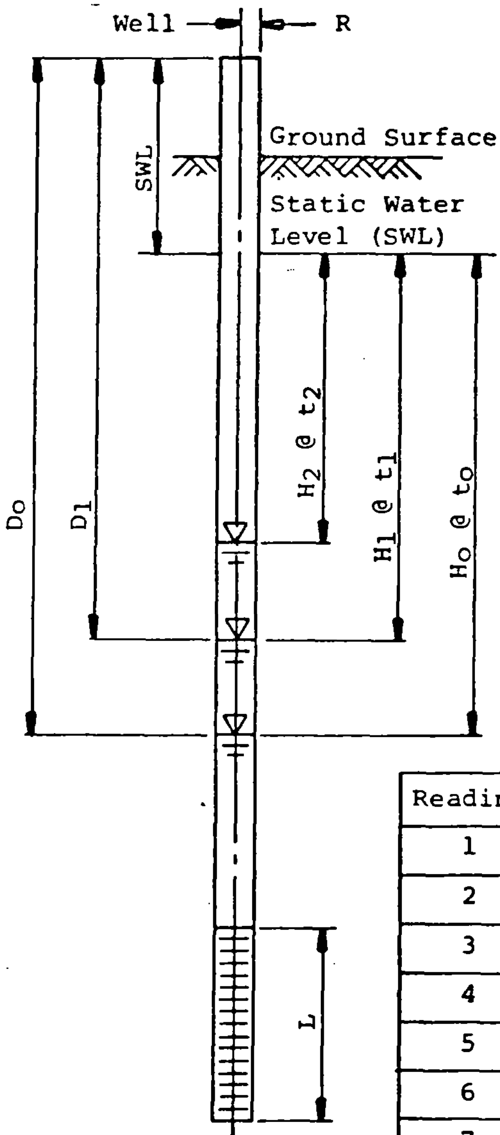
*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748
2) Location CAAP
3) Date 5-6-82
4) Personnel DTC/SAH
5) Well or Boring No. 7
6) R=Radius of Well 4.0 (in.)
7) L=Length of Screen 15.0 (ft.) (from well detail sheet)
8) Static Water Level 14.29 (ft.) (depth to water)
9) Total Well Depth 29.83 (ft.)
10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

11) saturated screen length = 13.22' = 403 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht}/H_o$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 8	0.166
3	t_2 0.183	D_2	H_2 6	0.125
4	t_3 0.217	D_3	H_3 4	0.083
5	t_4 0.283	D_4	H_4 2	0.042
6	t_5 0.400	D_5	H_5 0.8	0.017
7	t_6 0.533	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

[redacted] [redacted]

1) Project *1748*

2) Location *CMP*

3) Date *5-6-88*

4) Personnel *DTC/SAH*

5) Well or Boring No. *7*

6) R=Radius of Well *4.0* (in.)

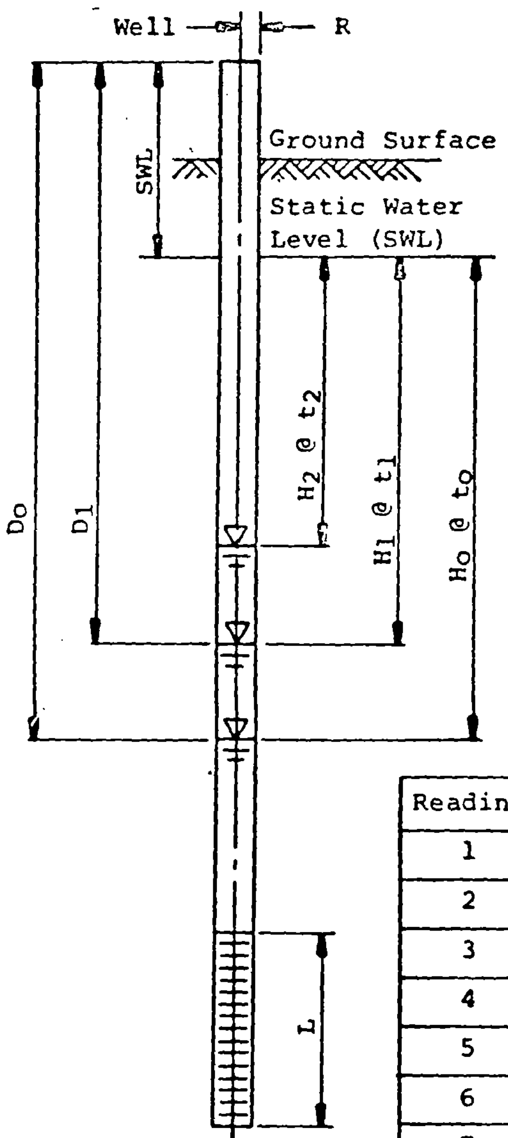
7) L=Length of Screen *15.0* (ft.)
(from well detail sheet)

8) Static Water Level *14.29* (ft.)
(depth to water)

9) Total Well Depth *29.83* (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #4

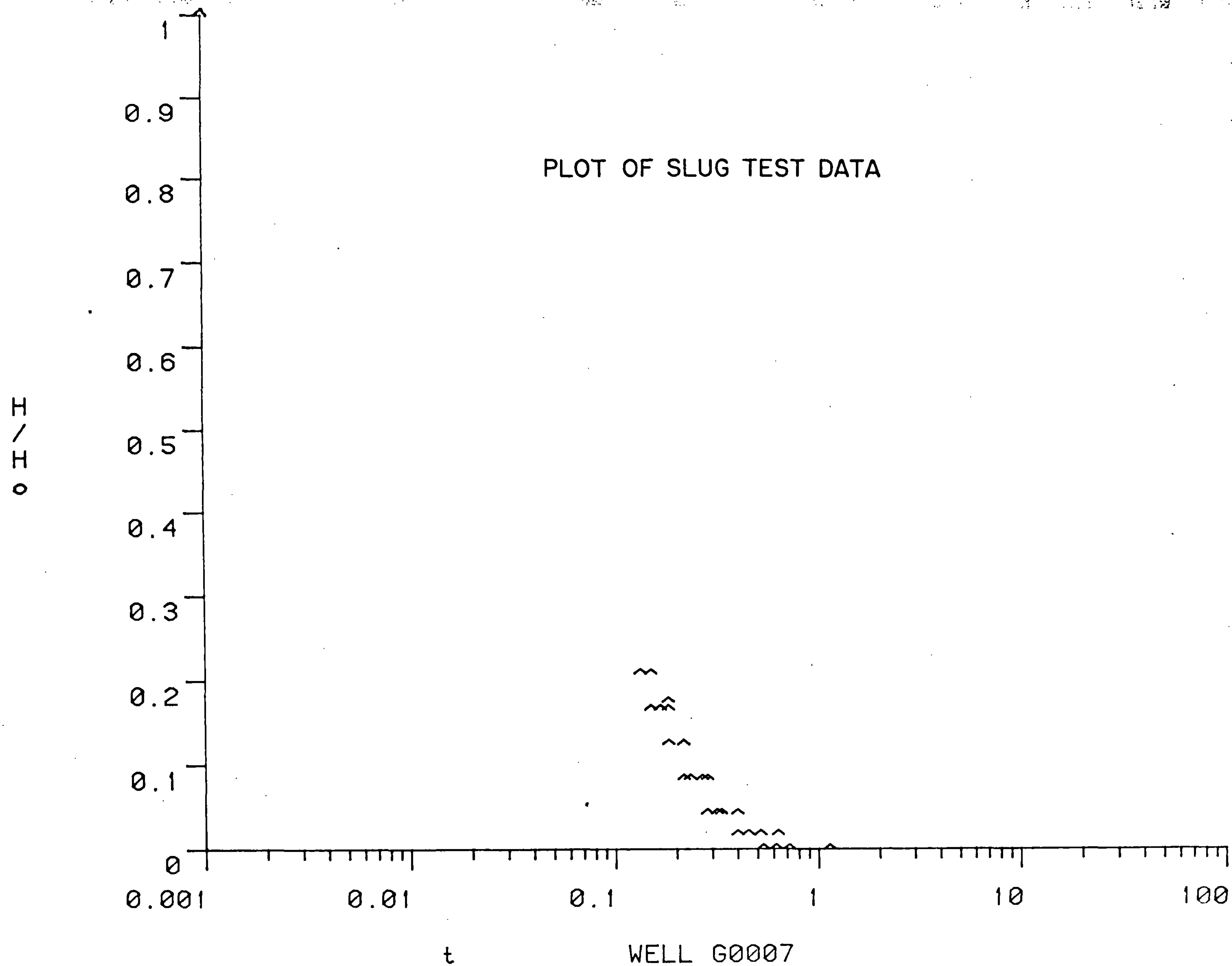
11) *saturated screen length = 13.22' = 403 cm*



Reading*	Time (Start) *minutes*	Depth to Water (After Baildown) D_t	*Ht* 2**	Ht/H_o
1	t_o *0*	D_o	H_o *48.113*	*1*
2	t_1 *0.133*	D_1	H_1 *10*	*0.208*
3	t_2 *0.150*	D_2	H_2 *8*	*0.166*
4	t_3 *0.183*	D_3	H_3 *6*	*0.125*
5	t_4 *0.233*	D_4	H_4 *4*	*0.083*
6	t_5 *0.317*	D_5	H_5 *2*	*0.042*
7	t_6 *0.450*	D_6	H_6 *0.8*	*0.017*
8	t_7 *0.617*	D_7	H_7 *0*	*0*
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0007

1) Project 1748 [redacted] [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 16

6) R=Radius of Well 4.0 (in.)

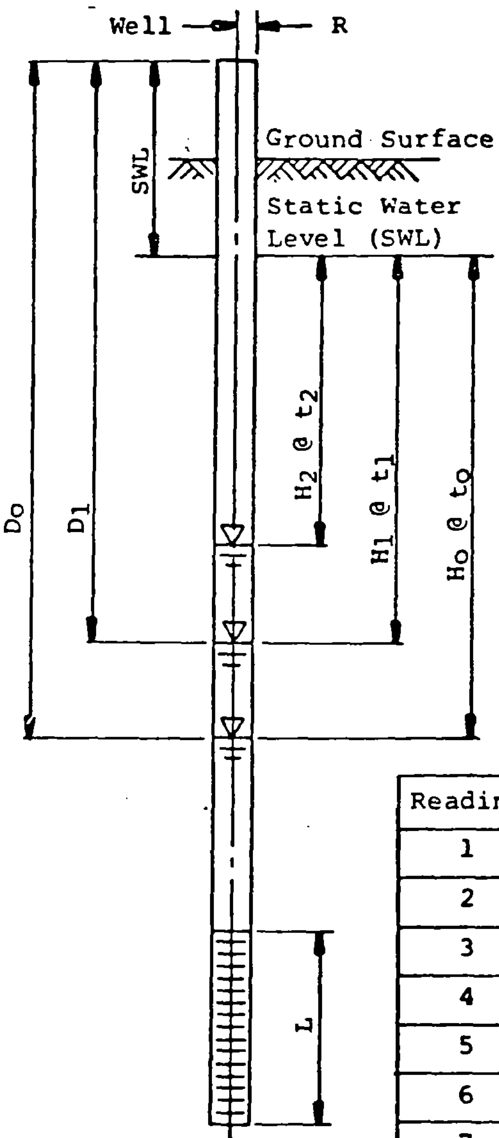
7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

8) Static Water Level 22.92 (ft.)
(depth to water)

9) Total Well Depth 33.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #1

11) saturated screen length = 8.82' = 269 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.100	D_1	H_1 16.5	0.343
3	t_2 0.133	D_2	H_2 14.5	0.301
4	t_3 0.150	D_3	H_3 12.5	0.260
5	t_4 0.183	D_4	H_4 10	0.208
6	t_5 0.283	D_5	H_5 8	0.166
7	t_6 0.350	D_6	H_6 6	0.125
8	t_7 0.517	D_7	H_7 4	0.083
9	t_8 1.100	D_8	H_8 2	0.042
10	t_9 2.783	D_9	H_9 0	0
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project -1748 [redacted] [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or boring No. 16

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

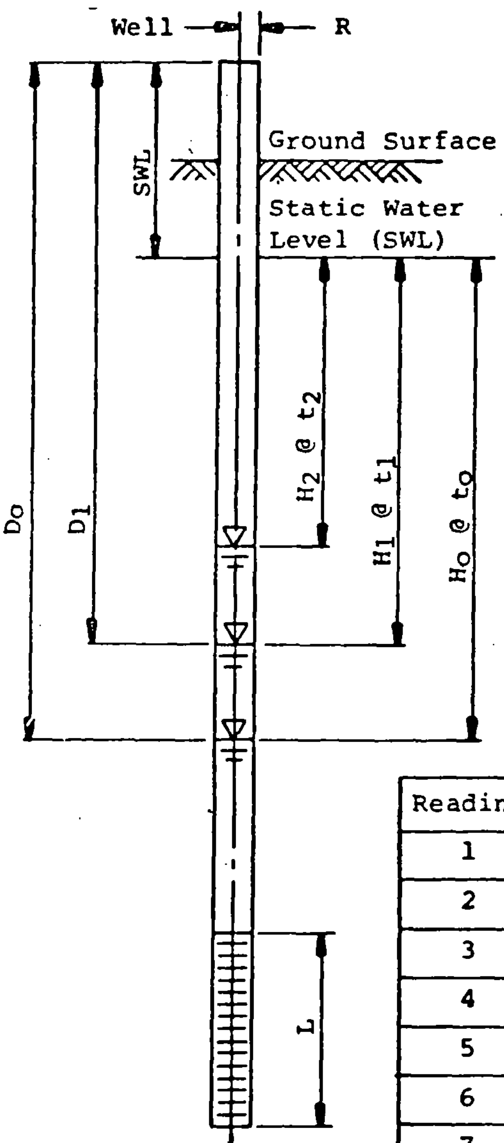
8) Static Water Level 22.92 (ft.)
(depth to water)

9) Total Well Depth 32.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length = 8.82 ft - 2.69 m



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht}/H_o$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.133	D_1	H_1 14.5	0.301
3	t_2 0.167	D_2	H_2 12.5	0.260
4	t_3 0.200	D_3	H_3 10	0.208
5	t_4 0.250	D_4	H_4 8	0.166
6	t_5 0.317	D_5	H_5 6	0.125
7	t_6 0.383	D_6	H_6 4	0.083
8	t_7 0.667	D_7	H_7 2	0.042
9	t_8 1.217	D_8	H_8 0	0
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748 [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 16

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

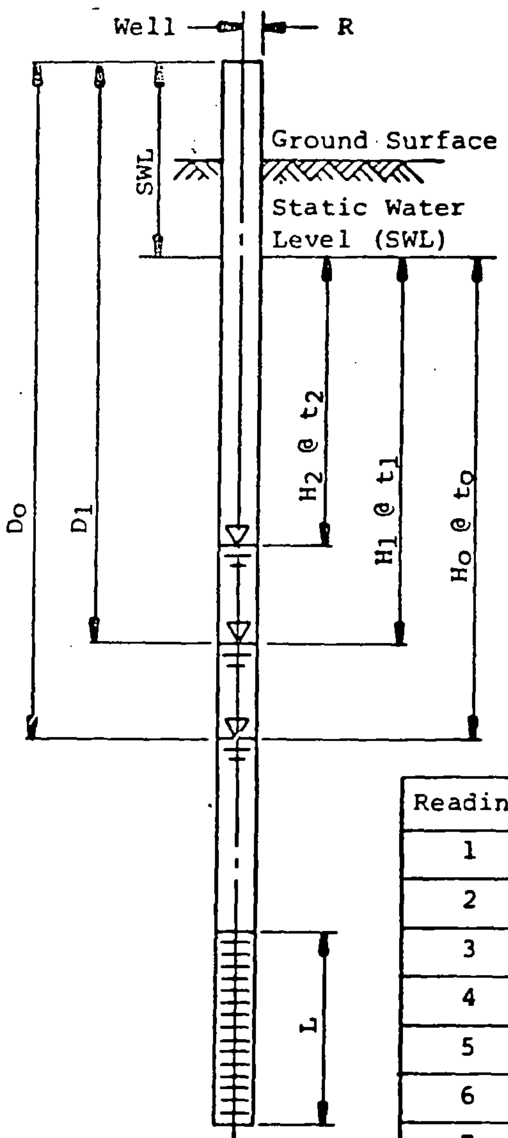
8) Static Water Level 22.92 (ft.)
(depth to water)

9) Total Well Depth 32.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

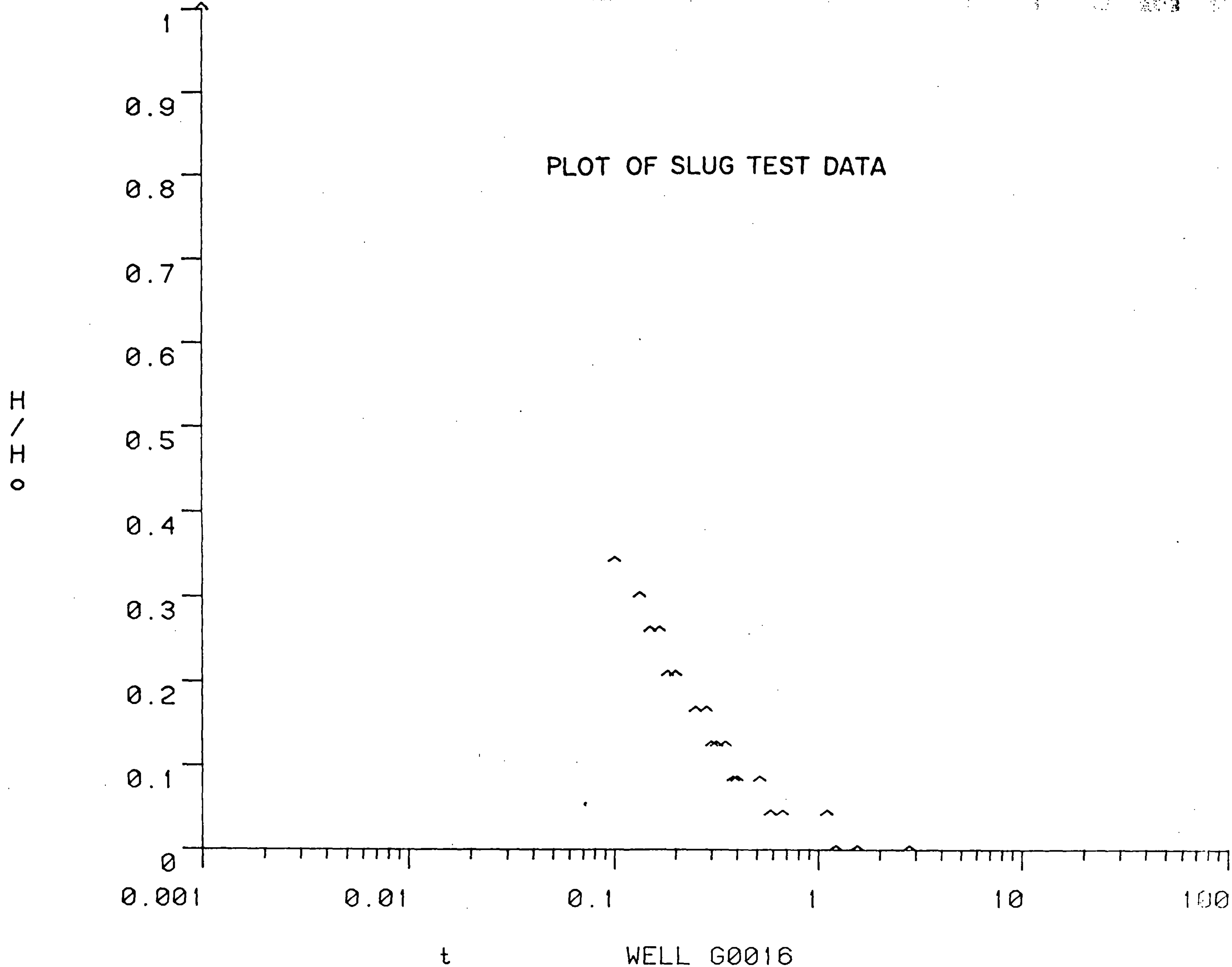
11) saturated screen length = 8.82 ft = 269 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 12.5	0.260
3	t_2 0.200	D_2	H_2 10	0.208
4	t_3 0.250	D_3	H_3 8	0.166
5	t_4 0.300	D_4	H_4 6	0.125
6	t_5 0.400	D_5	H_5 4	0.083
7	t_6 0.583	D_6	H_6 2	0.042
8	t_7 1.550	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0016

1) Project 1748 [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 17

6) R=Radius of Well 4.0 (in.)

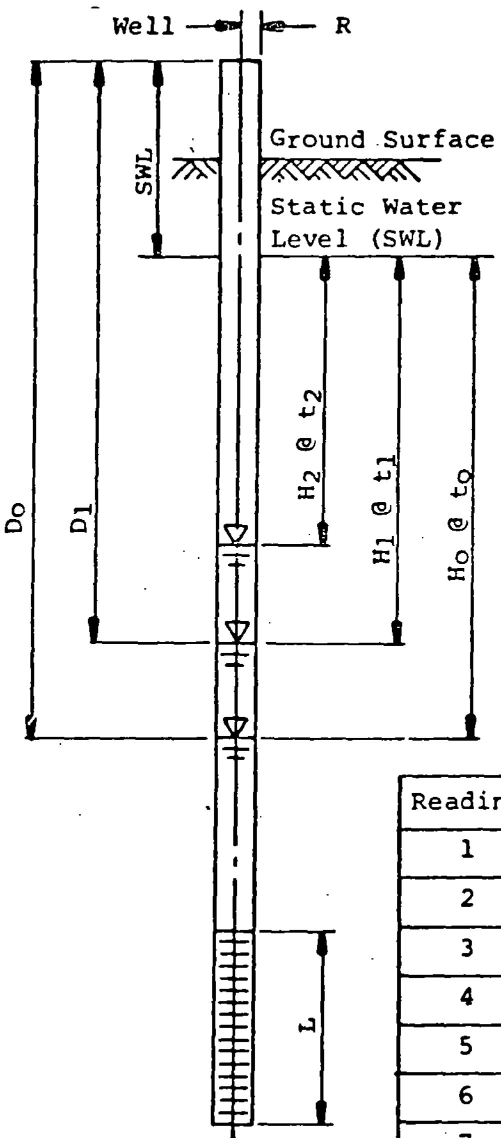
7) L=Length of Screen 15 (ft.)
(from well detail sheet)

8) Static Water Level 21.54 (ft.)
(depth to water)

9) Total Well Depth 33.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #1

11) saturated screen length: 11.74 ft = 358 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht}/H_o$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.350	D_1	H_1 2	0.042
3	t_2 1.850	D_2	H_2 0	0
4	t_3	D_3	H_3	
5	t_4	D_4	H_4	
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748 [redacted] [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 17

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.)
(from well detail sheet)

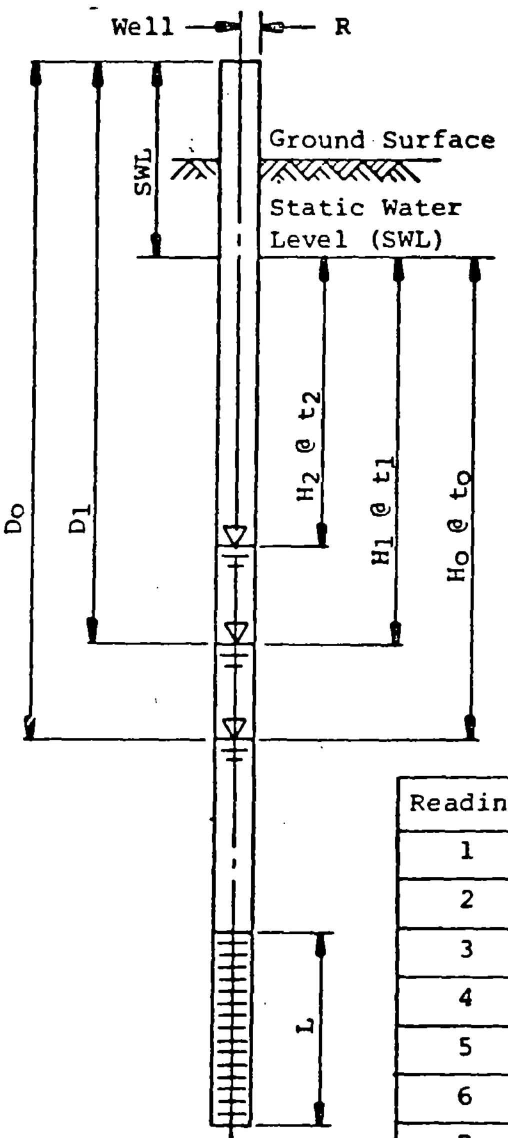
8) Static Water Level 21.54 (ft.)
(depth to water)

9) Total Well Depth 33.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length = 11.74 ft = 358 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.133	D_1	H_1 6	0.125
3	t_2 0.167	D_2	H_2 4	0.083
4	t_3 0.217	D_3	H_3 2	0.042
5	t_4 1.750	D_4	H_4 0	0
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748 [redacted] [redacted]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 17

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.)
(from well detail sheet)

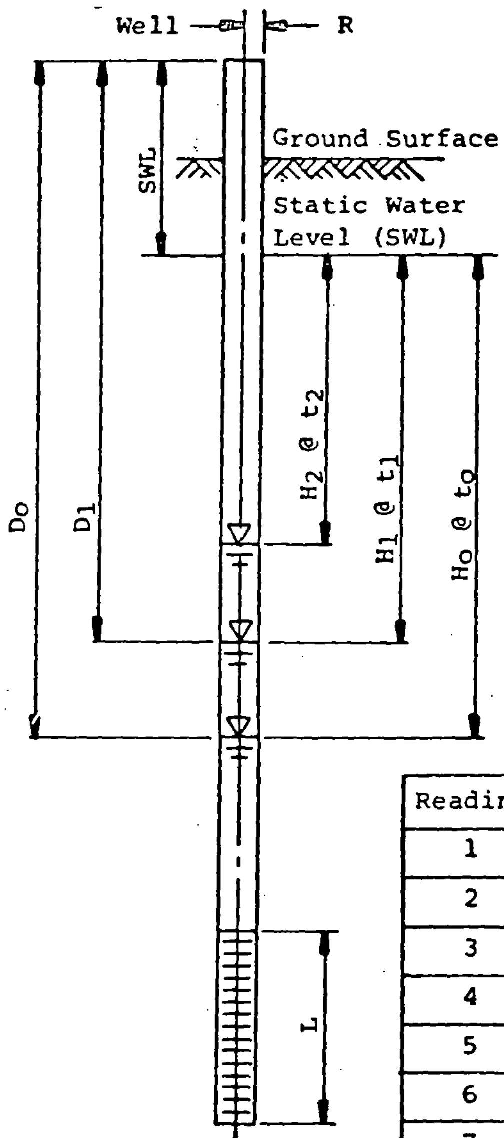
8) Static Water Level 21.54 (ft.)
(depth to water)

9) Total Well Depth 33.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

11) saturated screen length = 11.74 ft = 358 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	H_t / 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 4	0.083
3	t_2 0.217	D_2	H_2 2	0.042
4	t_3 2.600	D_3	H_3 0	0
5	t_4	D_4	H_4	
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 22

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

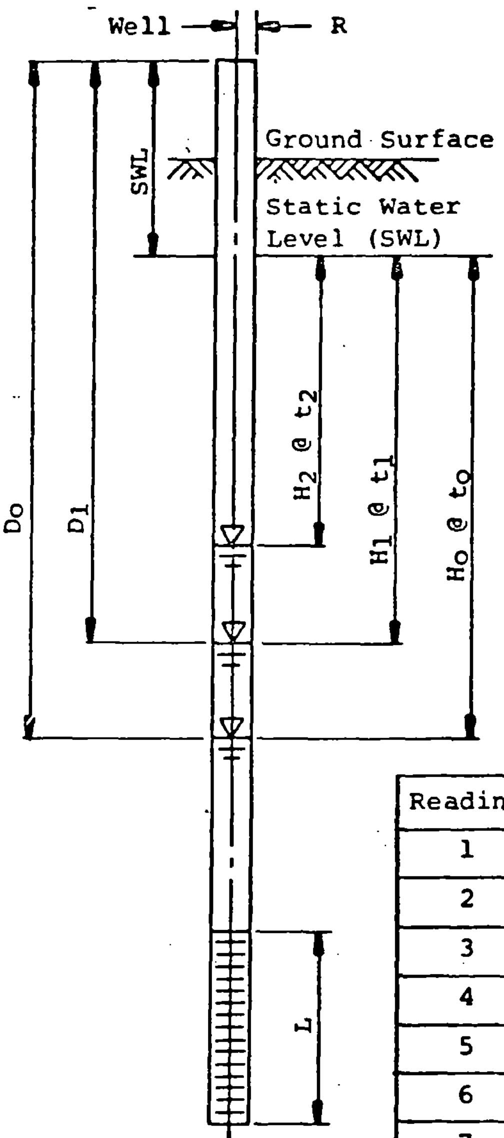
8) Static Water Level 19.75 (ft.)
(depth to water)

9) Total Well Depth 35.25 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 15.0' = 457 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.150	D_1	H_1 10	0.208
3	t_2 0.183	D_2	H_2 8	0.166
4	t_3 0.233	D_3	H_3 6	0.125
5	t_4 0.300	D_4	H_4 4	0.083
6	t_5 0.383	D_5	H_5 2	0.042
7	t_6 0.567	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 22

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.) (from well detail sheet)

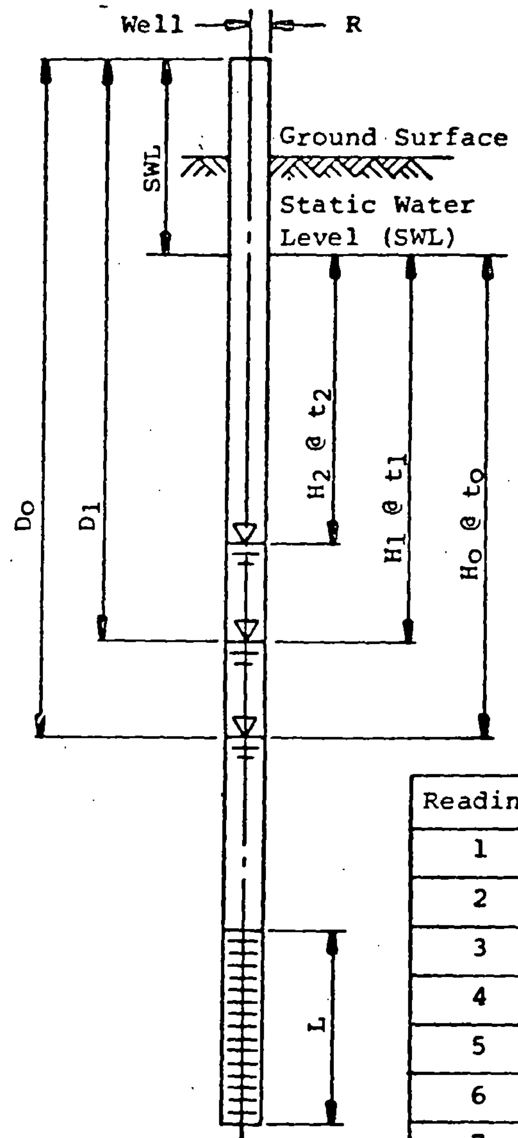
8) Static Water Level 19.75 (ft.) (depth to water)

9) Total Well Depth 35.25 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length = 15.0' = 457 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.133	D_1	H_1 10	0.208
3	t_2 0.150	D_2	H_2 8	0.166
4	t_3 0.233	D_3	H_3 6	0.125
5	t_4 0.283	D_4	H_4 4	0.083
6	t_5 0.350	D_5	H_5 2	0.042
7	t_6 0.467	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 22

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

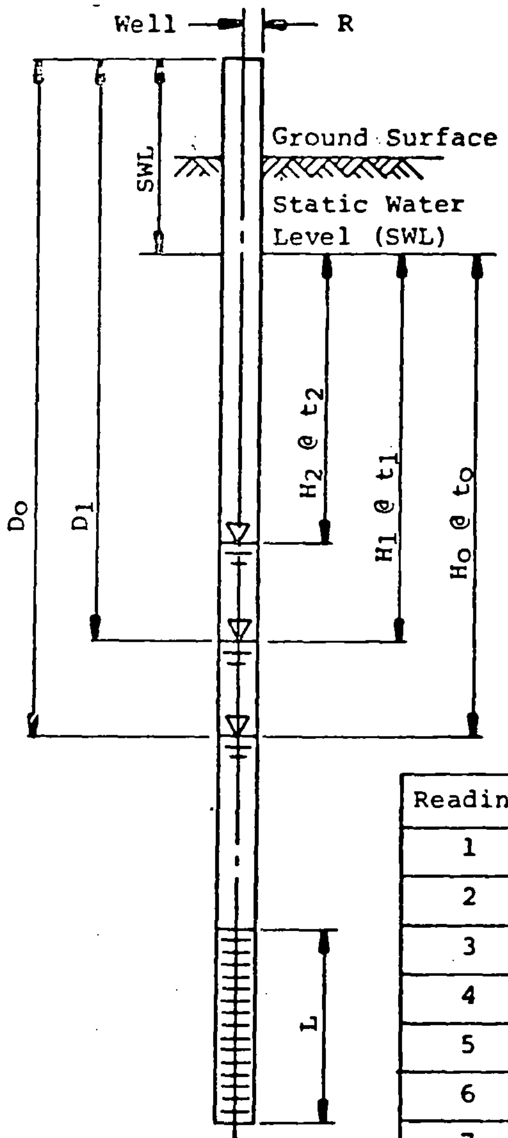
8) Static Water Level 19.75 (ft.)
(depth to water)

9) Total Well Depth 35.25 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

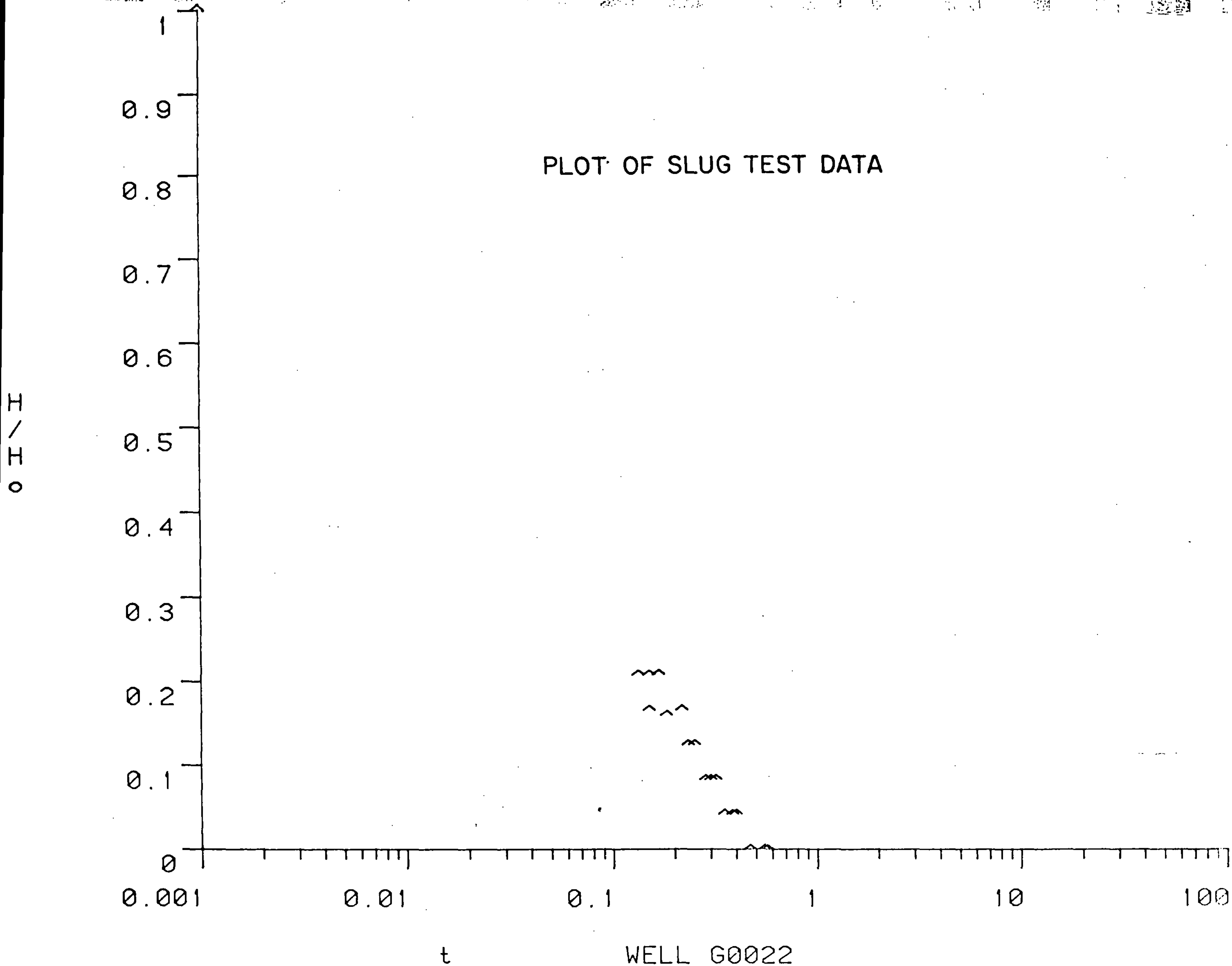
11) saturated screen length = 15.0' = 457 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht}/H_o$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.100	D_1	H_1 18	0.374
3	t_2 0.133	D_2	H_2 12	0.249
4	t_3 0.167	D_3	H_3 10	0.208
5	t_4 0.217	D_4	H_4 8	0.166
6	t_5 0.250	D_5	H_5 6	0.125
7	t_6 0.317	D_6	H_6 4	0.083
8	t_7 0.400	D_7	H_7 2	0.042
9	t_8 0.550	D_8	H_8 0	0
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
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100
t
WELL G0022

1) Project 1745

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 23

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.)
(from well detail sheet)

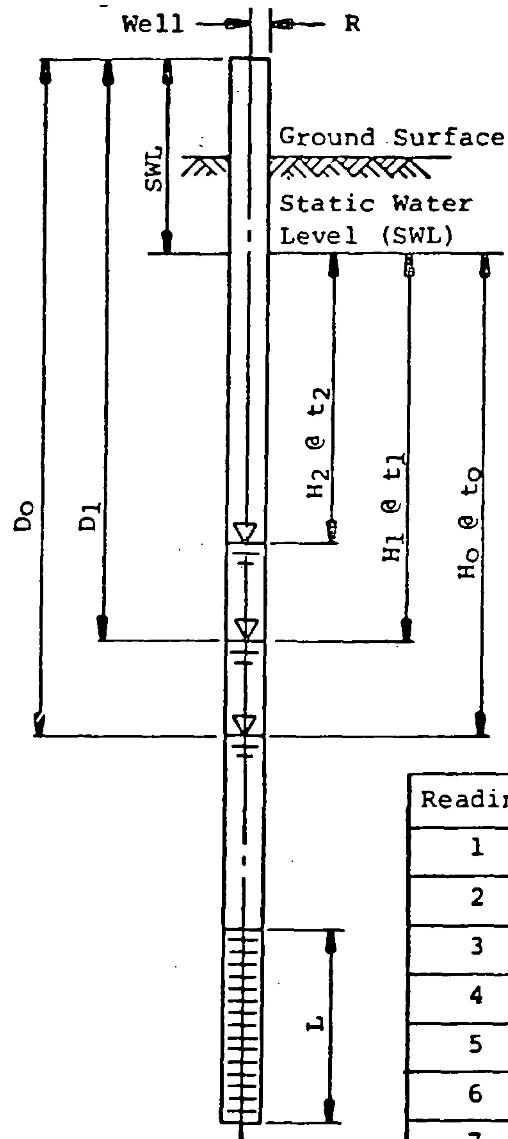
8) Static Water Level 21.92 (ft.)
(depth to water)

9) Total Well Depth 36.92 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 14.66 ft = 447 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.067	D_1	H_1 20	0.416
3	t_2 0.117	D_2	H_2 14	0.291
4	t_3 0.150	D_3	H_3 8	0.166
5	t_4 0.167	D_4	H_4 6	0.125
6	t_5 0.200	D_5	H_5 4	0.083
7	t_6 0.267	D_6	H_6 2	0.042
8	t_7 0.350	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 23

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.)
(from well detail sheet)

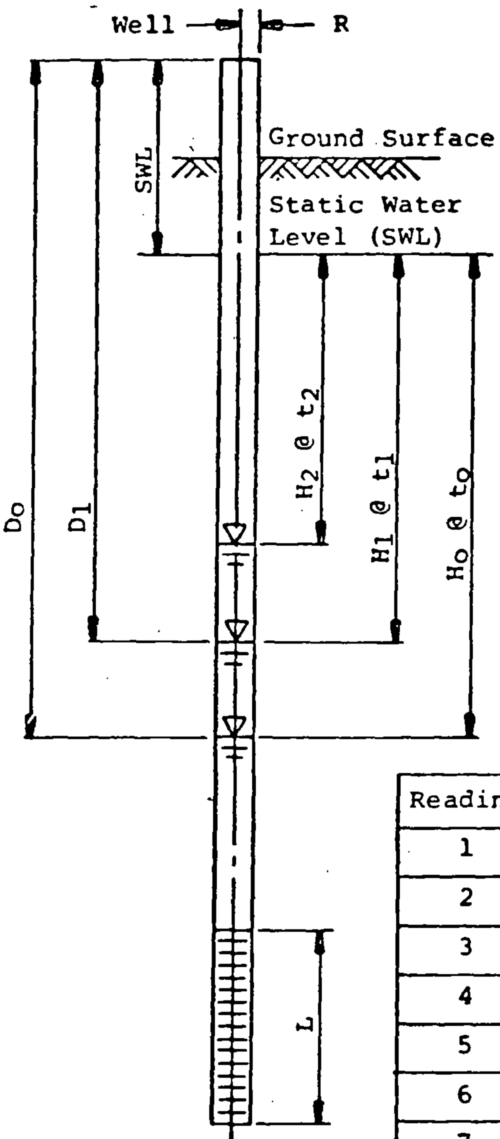
8) Static Water Level 21.42 (ft.)
(depth to water)

9) Total Well Depth 36.42 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length 14.66 ft = 447 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht/H_o}$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.083	D_1	H_1 14	0.291
3	t_2 0.117	D_2	H_2 8	0.166
4	t_3 0.150	D_3	H_3 6	0.125
5	t_4 0.167	D_4	H_4 4	0.083
6	t_5 0.200	D_5	H_5 2	0.042
7	t_6 0.250	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 23

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.) (from well detail sheet)

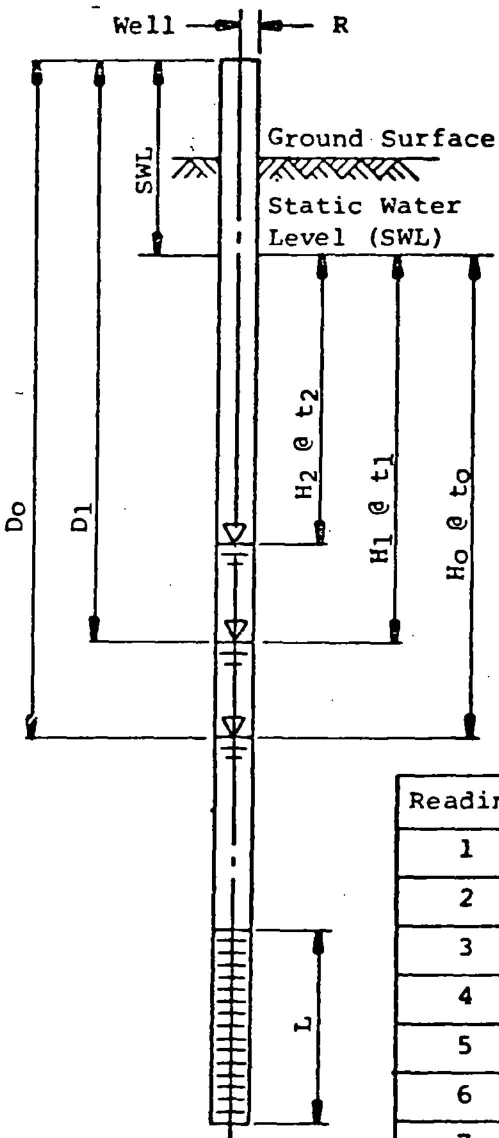
8) Static Water Level 21.42 (ft.) (depth to water)

9) Total Well Depth 36.42 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

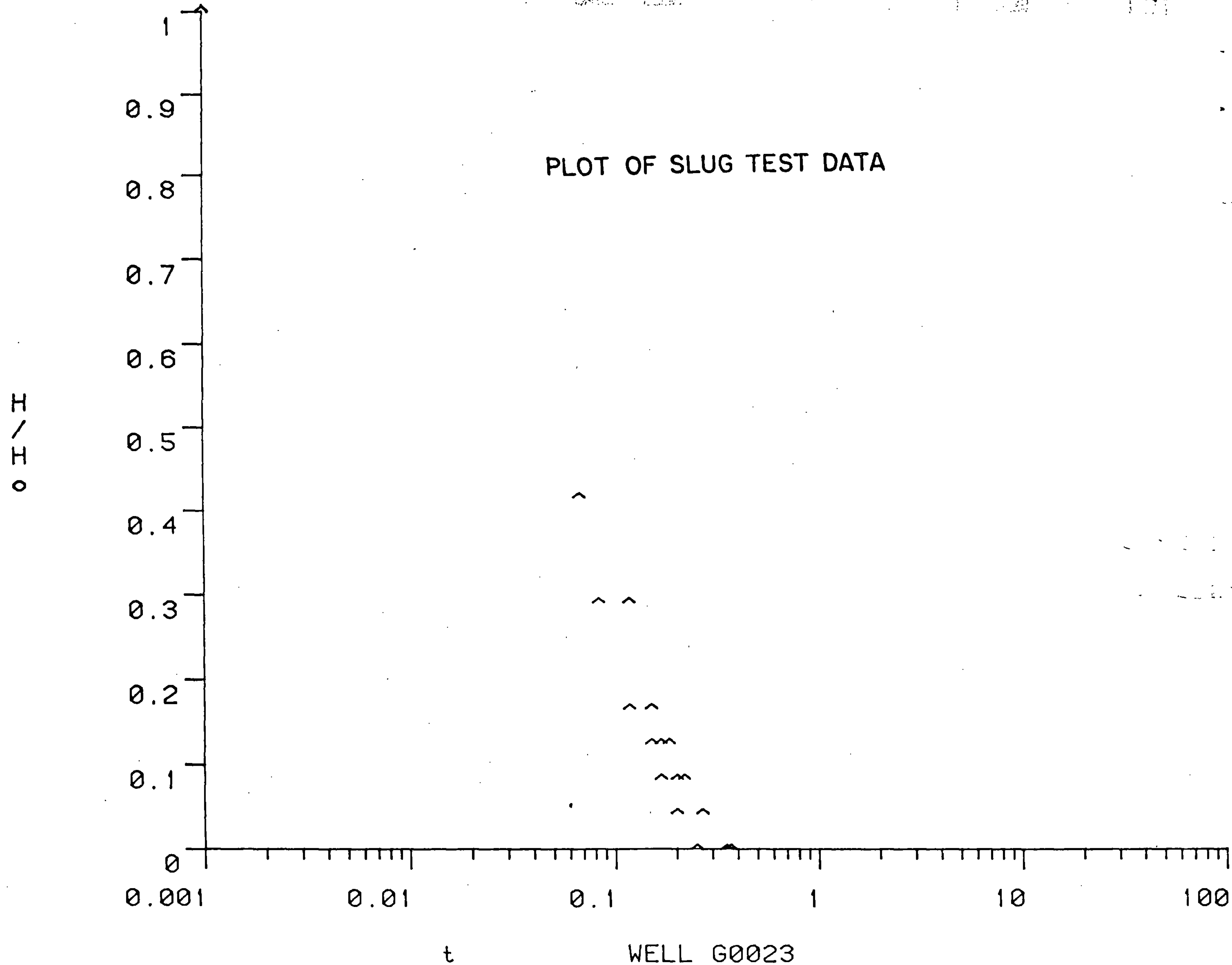
11) saturated screen length = 1466' = 447 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.067	D_1	H_1 20	0.416
3	t_2 0.117	D_2	H_2 14	0.291
4	t_3 0.150	D_3	H_3 8	0.166
5	t_4 0.183	D_4	H_4 6	0.125
6	t_5 0.217	D_5	H_5 4	0.083
7	t_6 0.267	D_6	H_6 2	0.042
8	t_7 0.367	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0023

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 24

6) R=Radius of Well 4.0 (in.)

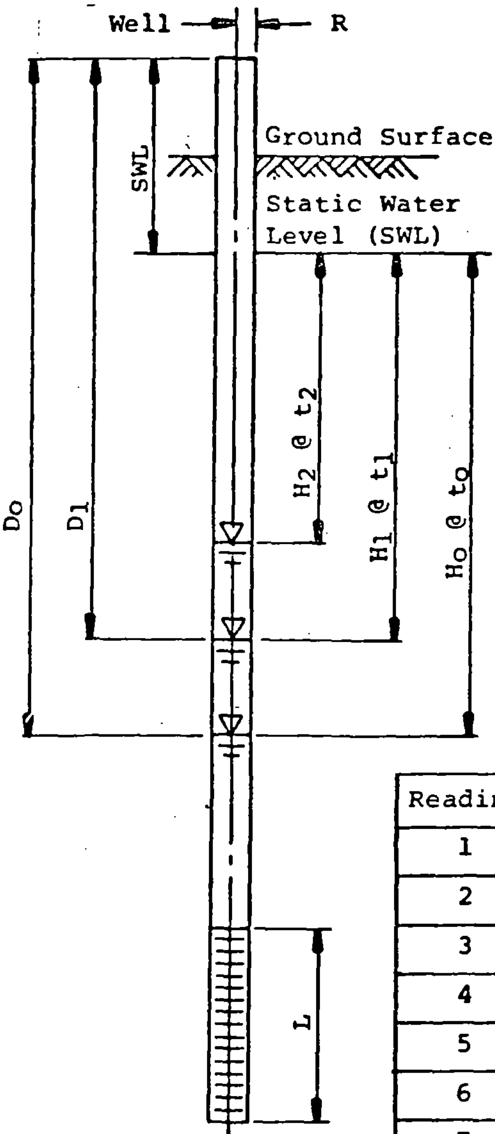
7) L=Length of Screen 15 (ft.)
(from well detail sheet)

8) Static Water Level 19.729 (ft.)
(depth to water)

9) Total Well Depth 33.229 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run #1

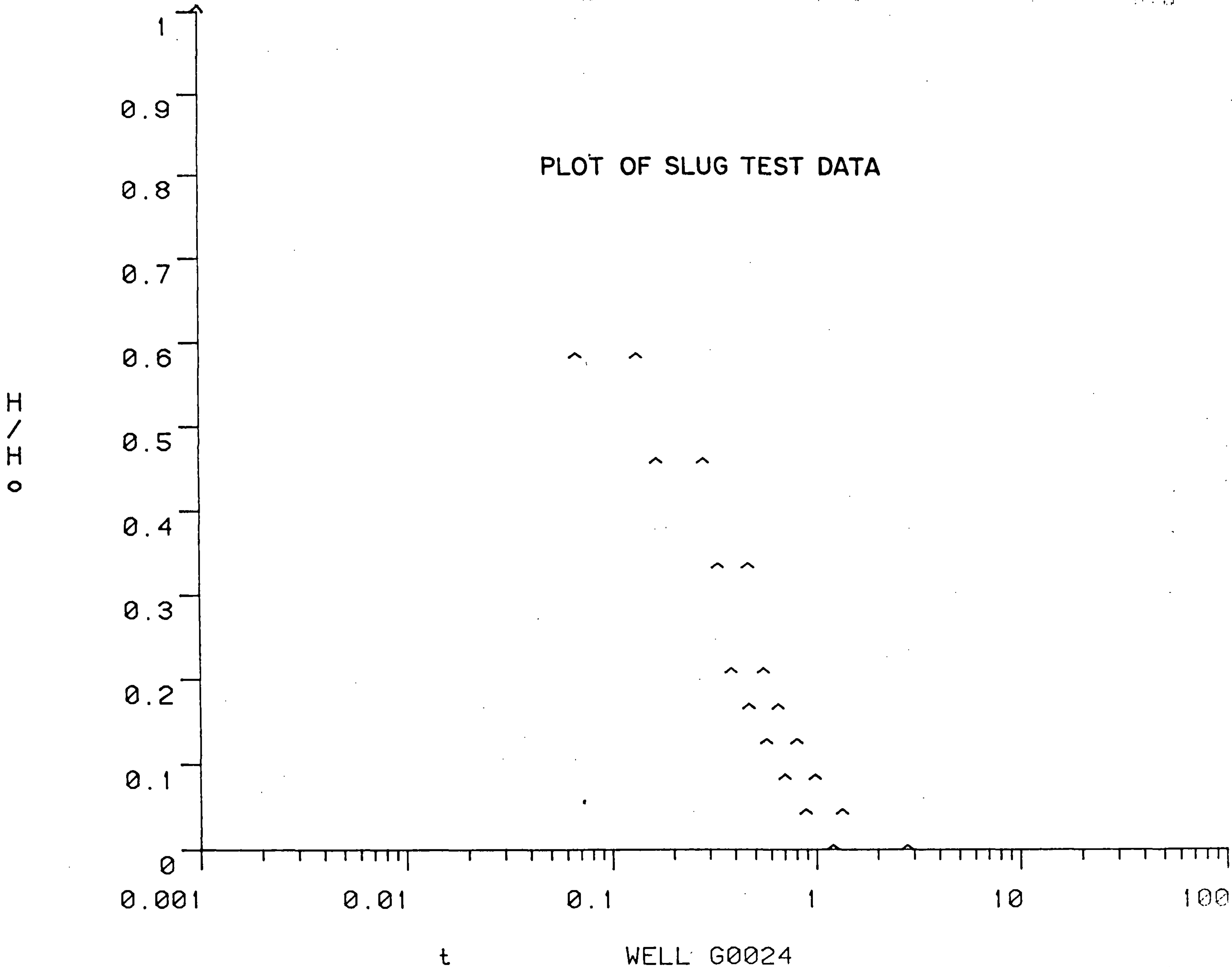
11) saturated screen length = 13.22' = 403 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/H_O
1	t_O 0	D_O	H_O 48.113	1
2	t_1 0.133	D_1	H_1 28	0.582
3	t_2 0.283	D_2	H_2 22	0.457
4	t_3 0.467	D_3	H_3 16	0.333
5	t_4 0.550	D_4	H_4 10	0.208
6	t_5 0.650	D_5	H_5 8	0.166
7	t_6 0.800	D_6	H_6 6	0.125
8	t_7 0.983	D_7	H_7 4	0.083
9	t_8 1.333	D_8	H_8 2	0.042
10	t_9 2.767	D_9	H_9 0	0
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0024

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 27

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

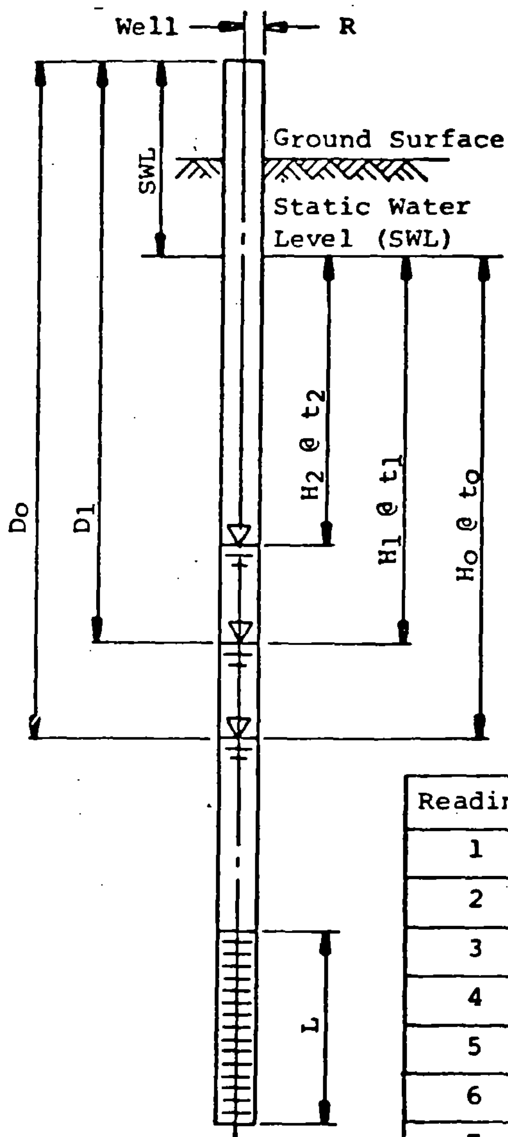
8) Static Water Level 26.25 (ft.)
(depth to water)

9) Total Well Depth 41.875 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

11) saturated screen length = 14.40 ft = 439cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	$\frac{Ht}{2}$**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.133	D_1	H_1 6	0.125
3	t_2 0.167	D_2	H_2 4	0.083
4	t_3 0.233	D_3	H_3 2	0.042
5	t_4 0.433	D_4	H_4 0	0
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 27

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

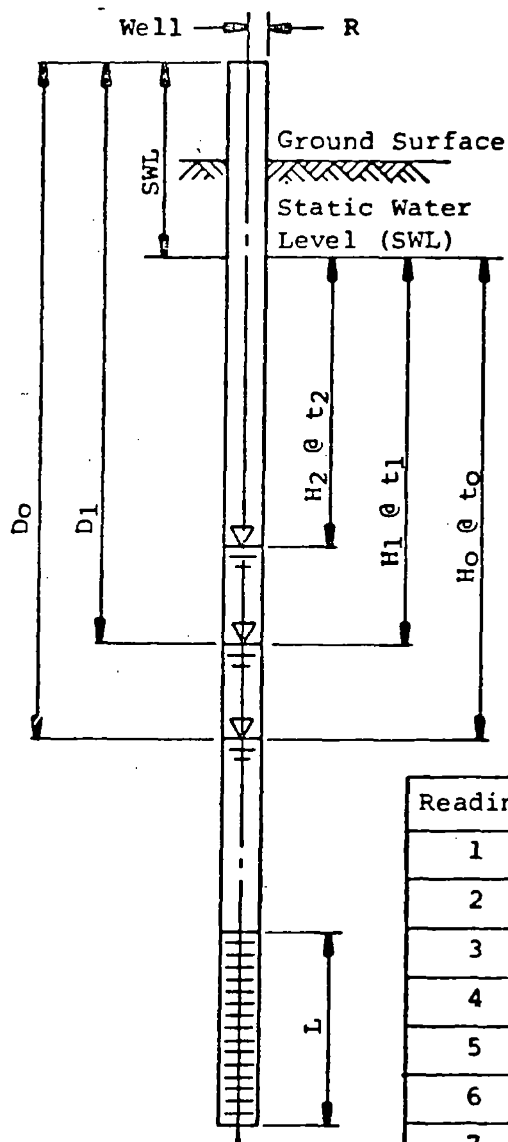
8) Static Water Level 26.25 (ft.)
(depth to water)

9) Total Well Depth 41.875 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 14.43 ft = 439 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	Ht/Ho
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.133	D_1	H_1 10	0.208
3	t_2 0.167	D_2	H_2 8	0.166
4	t_3 0.233	D_3	H_3 6	0.125
5	t_4 0.383	D_4	H_4 4	0.083
6	t_5 1.117	D_5	H_5 2	0.042
7	t_6 *N.D.	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

* N.D. - No Data

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 27

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

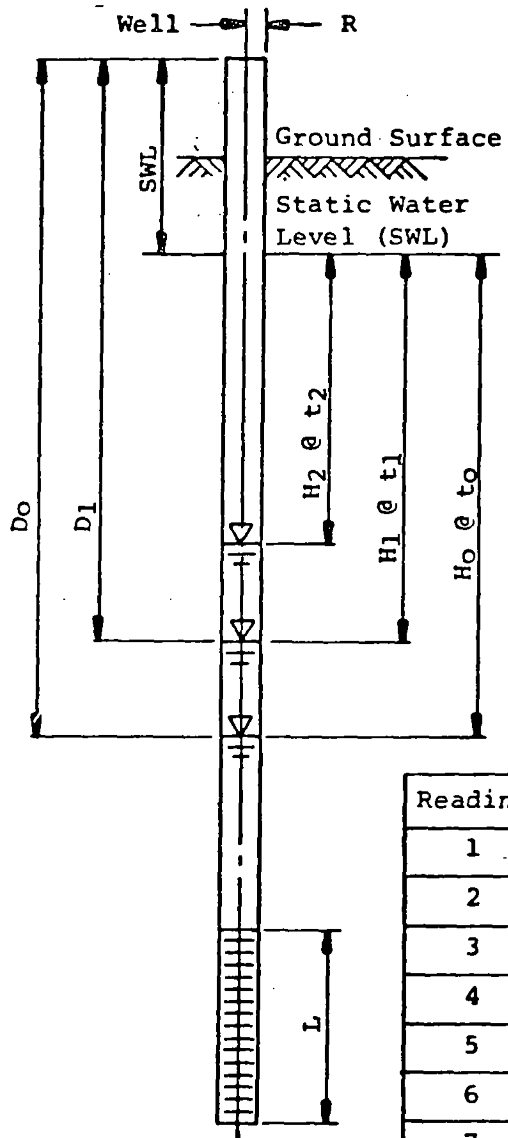
8) Static Water Level 26.25 (ft.)
(depth to water)

9) Total Well Depth 41.875 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

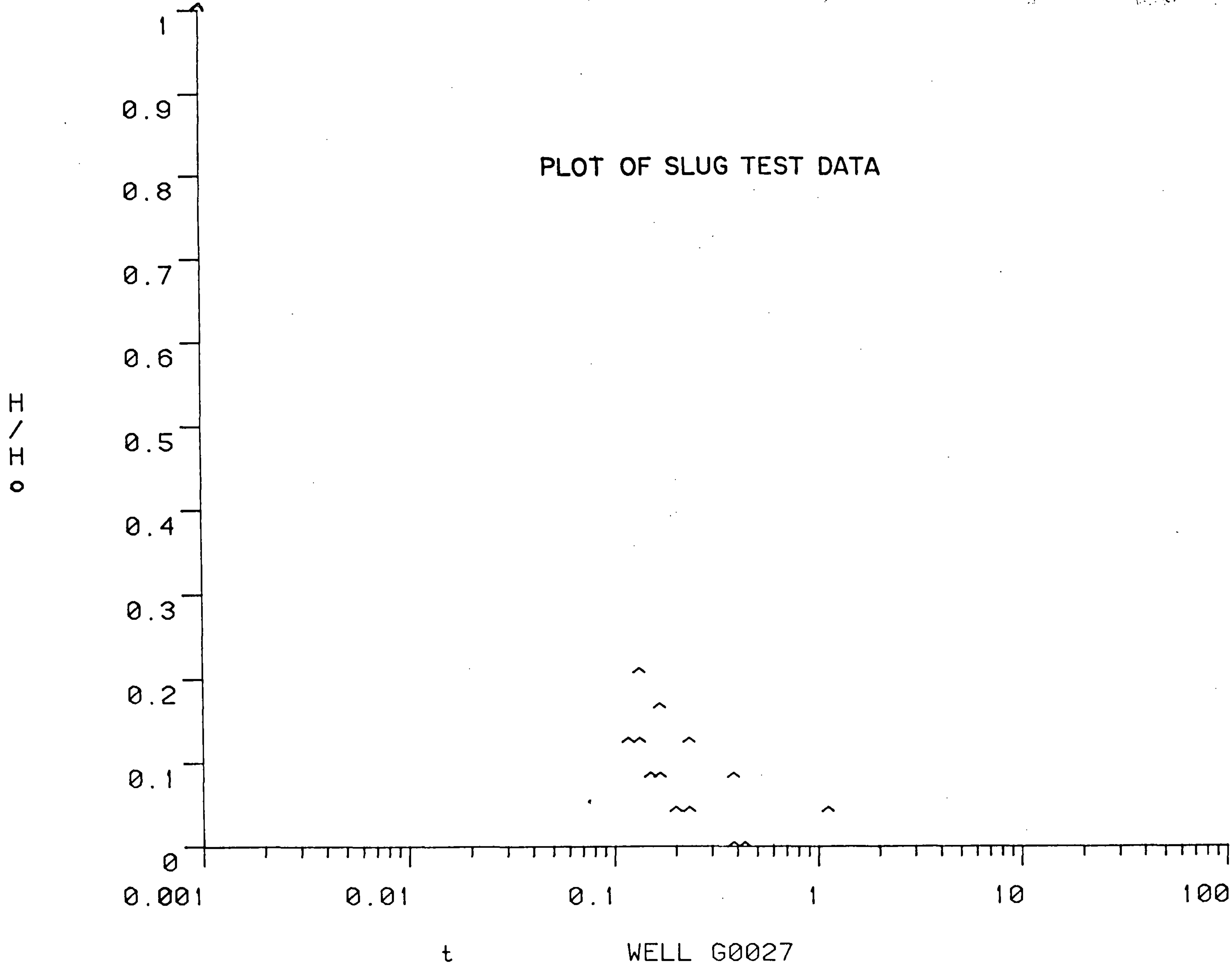
11) saturated screen length = 14.40 ft = 439 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht **	Ht/Ho
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.117	D_1	H_1 6	0.125
3	t_2 0.150	D_2	H_2 4	0.083
4	t_3 0.200	D_3	H_3 2	0.042
5	t_4 0.383	D_4	H_4 0	0
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0027

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 30

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

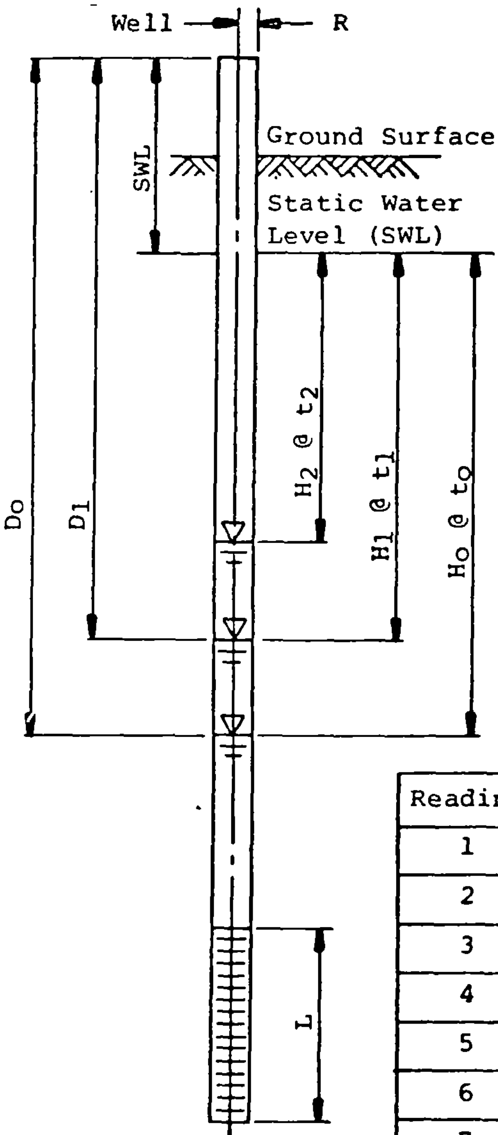
8) Static Water Level 22.583 (ft.)
(depth to water)

9) Total Well Depth 35.583 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 13.16 ft = 401 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	$\frac{Ht}{2}$**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.083	D_1	H_1 10	0.208
3	t_2 0.117	D_2	H_2 8	0.166
4	t_3 0.150	D_3	H_3 6	0.125
5	t_4 0.200	D_4	H_4 4	0.083
6	t_5 0.333	D_5	H_5 2	0.042
7	t_6 0.783	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

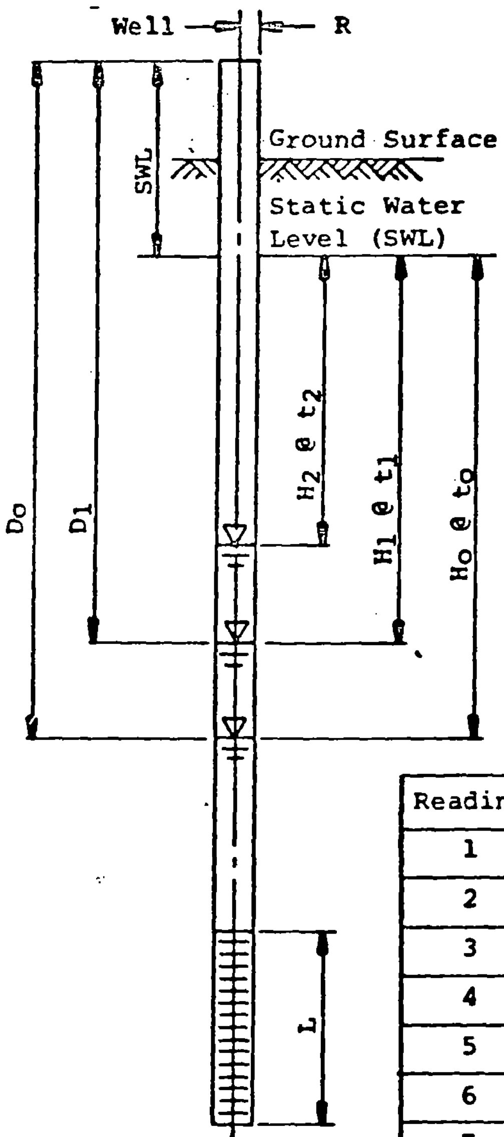
**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel OTC/SRH



5) Well or Boring No. 30

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15 (ft.)
(from well detail sheet)

8) Static Water Level 22.583 (ft.)
(depth to water)

9) Total Well Depth 35.583 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

11) saturated screen length = 13.16 ft = 401 cm

Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.083	D_1	H_1 16	.333
3	t_2 0.117	D_2	H_2 10	0.208
4	t_3 0.150	D_3	H_3 8	0.166
5	t_4 0.167	D_4	H_4 6	0.125
6	t_5 0.200	D_5	H_5 4	0.083
7	t_6 0.283	D_6	H_6 2	0.042
8	t_7 0.483	D_7	H_7 0	0
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 30

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

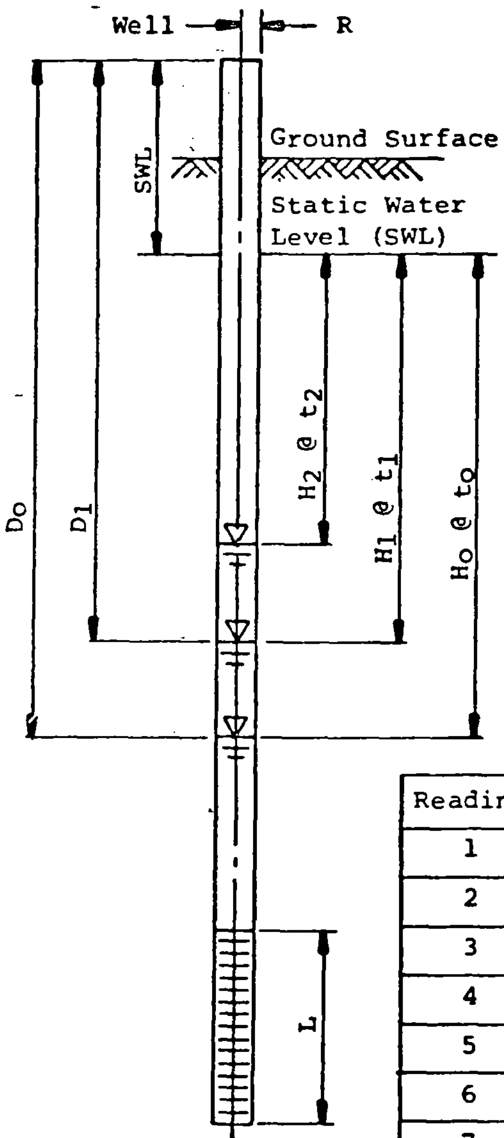
8) Static Water Level 22.583 (ft.)
(depth to water)

9) Total Well Depth 35.583 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #2

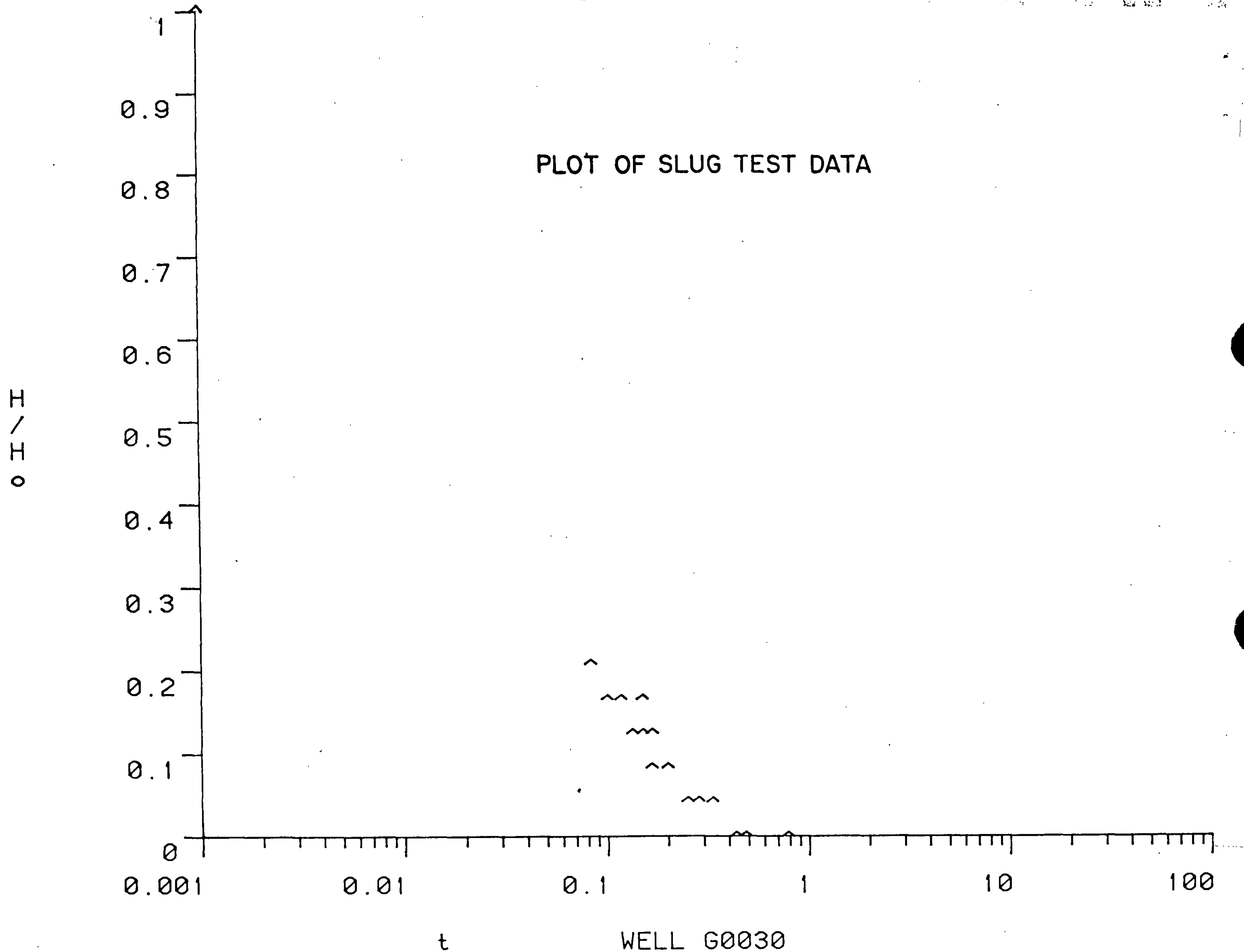
11) saturated screen length = 13.16 ft = 401 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	H_t/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.083	D_1	H_1 10	0.208
3	t_2 0.100	D_2	H_2 8	0.166
4	t_3 0.133	D_3	H_3 6	0.125
5	t_4 0.166	D_4	H_4 4	0.083
6	t_5 0.250	D_5	H_5 2	0.042
7	t_6 0.433	D_6	H_6 0	0
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0030

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 33

6) R=Radius of Well 4.0 (in.)

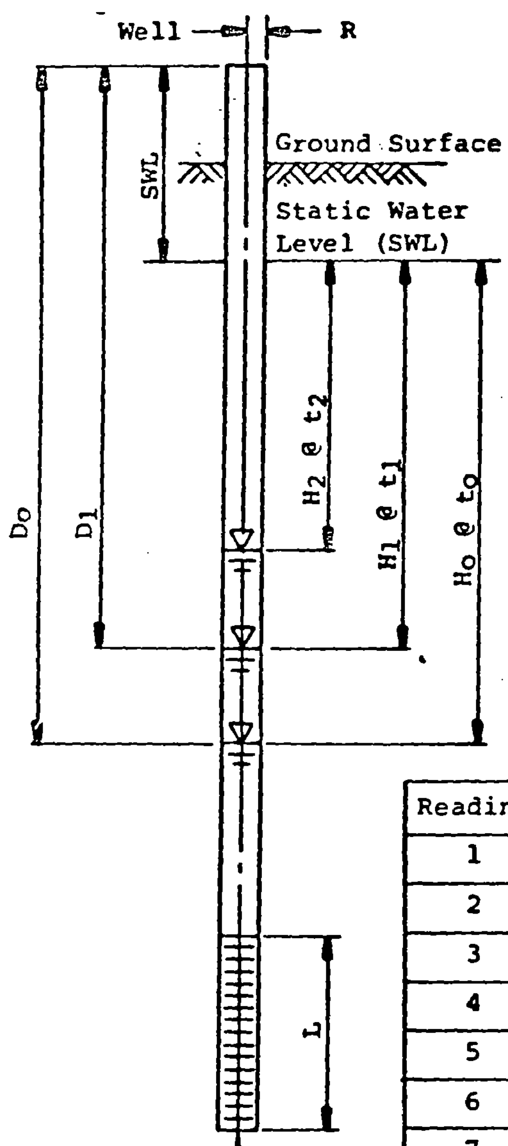
7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

8) Static Water Level 22.417 (ft.)
(depth to water)

9) Total Well Depth 36.167 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet
Run # 2

11) saturated screen length = 11.15 ft = 340 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	$\frac{Ht}{2}$**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.167	D_1	H_1 2	0.042
3	t_2 0.267	D_2	H_2 0	0
4	t_3	D_3	H_3	
5	t_4	D_4	H_4	
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project [illegible]

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SAH

5) Well or Boring No. 33

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

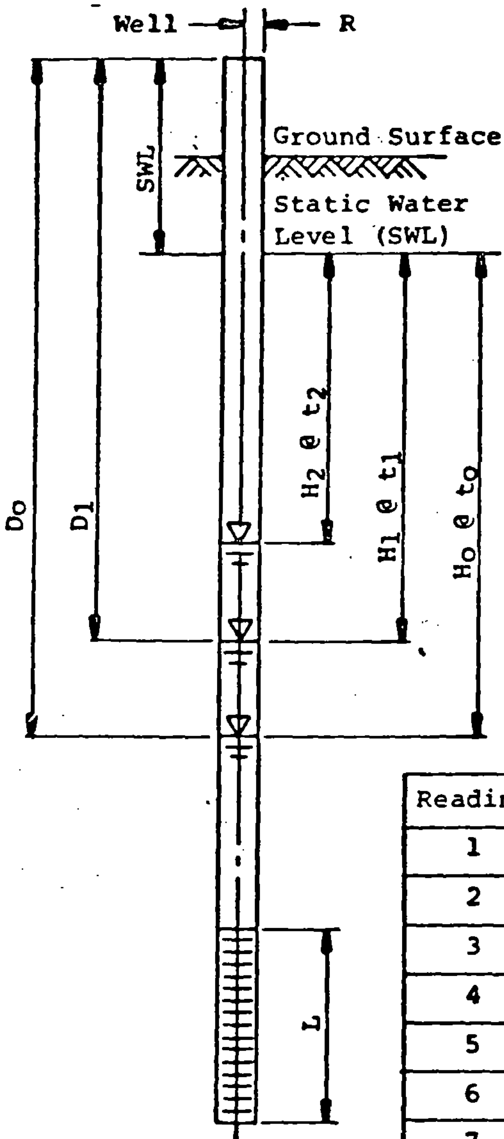
8) Static Water Level 22.417 (ft.)
(depth to water)

9) Total Well Depth 36.167 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #1

11) saturated screen length = 11.15 ft = 340 cm



Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	$\frac{Ht}{2}$**	Ht/H_o
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.183	D_1	H_1 2	0.042
3	t_2 0.383	D_2	H_2 0	0
4	t_3	D_3	H_3	
5	t_4	D_4	H_4	
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.

1) Project 1748

2) Location CAAP

3) Date 5-6-82

4) Personnel DTC/SRH

5) Well or Boring No. 33

6) R=Radius of Well 4.0 (in.)

7) L=Length of Screen 15.0 (ft.)
(from well detail sheet)

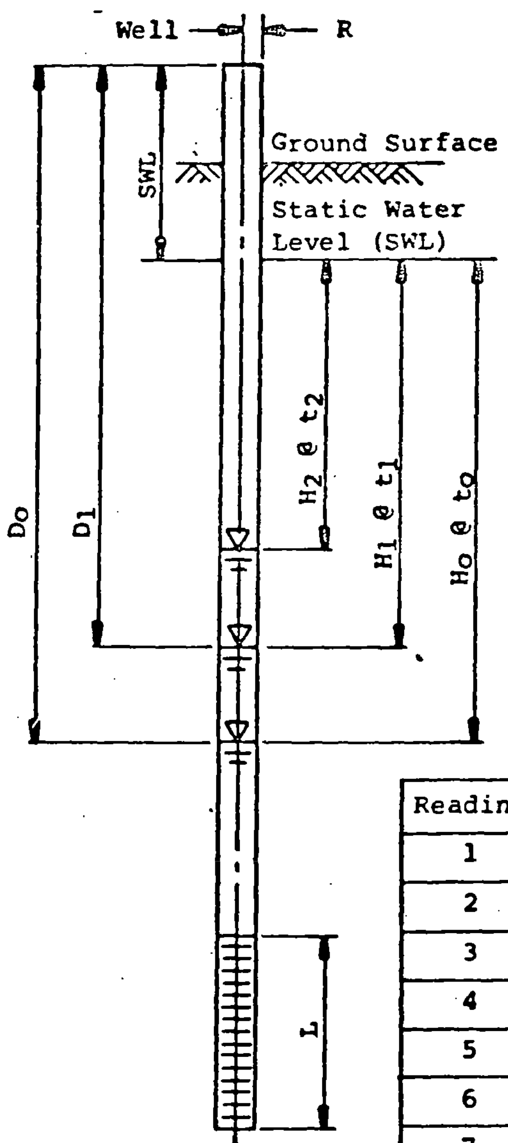
8) Static Water Level 22.417 (ft.)
(depth to water)

9) Total Well Depth 36.167 (ft.)

10) Baildown Data (from Test) - Record Information in Minutes and Feet

Run #3

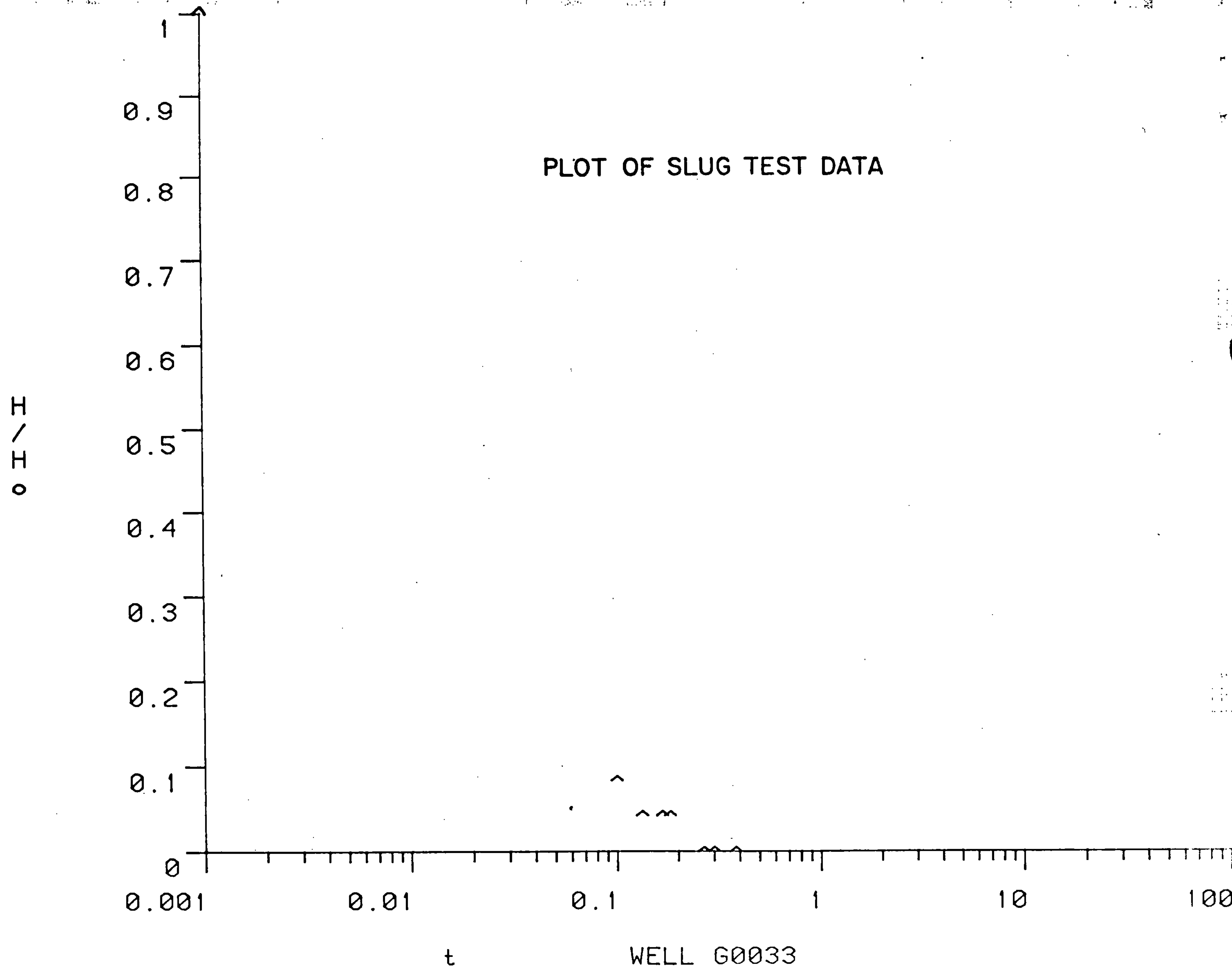
11) saturated screen length = 11.15 ft = 340 cm

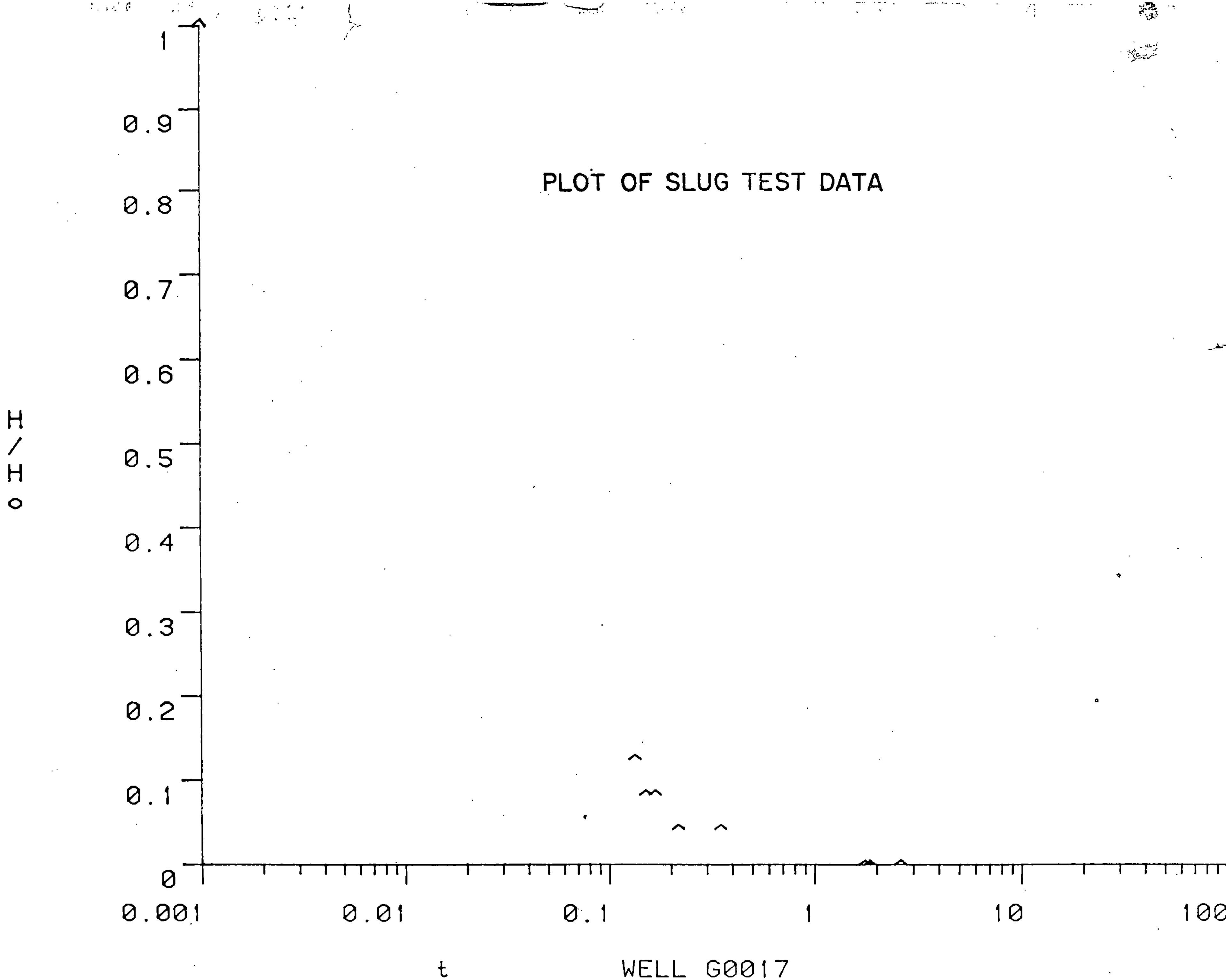


Reading*	Time (Start) minutes	Depth to Water (After Baildown) D_t	Ht 2**	$\overline{Ht}/H_o$
1	t_o 0	D_o	H_o 48.113	1
2	t_1 0.100	D_1	H_1 4	0.083
3	t_2 0.133	D_2	H_2 2	0.042
4	t_3 0.300	D_3	H_3 0	0
5	t_4	D_4	H_4	
6	t_5	D_5	H_5	
7	t_6	D_6	H_6	
8	t_7	D_7	H_7	
9	t_8	D_8	H_8	
10	t_9	D_9	H_9	
11	t_{10}	D_{10}	H_{10}	
12	t_{11}	D_{11}	H_{11}	
13	t_{12}	D_{12}	H_{12}	
14	t_{13}	D_{13}	H_{13}	

*Take readings until well is stabilized, if tight soils - test may be stopped prior to stabilization as necessary.

**Disregard Columns 2 and 3 during baildown test. They are for office calculations.


PLOT OF SLUG TEST DATA
H/Ho
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.001
0.01
0.1
1
10
100
t
WELL G0033


PLOT OF SLUG TEST DATA
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
H/Ho
0.001
0.01
0.1
1
10
100
t
WELL G0017